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MANUAL

OF THE

VERTEBRATES

OF THE

NORTHERN UNITED STATES,

INCLUDING

THE DISTRICT EAST OF THE MISSISSIPPI RIVER, AND NORTH OF
NORTH CAROLINA AND TENNESSEE, EXCLUSIVE
OF MARINE SPECIES.

BY

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FOURTH EDITION, REVISED AND ENLARGED.

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PREFACE.

This book has been written to give collectors and students who are not specialists, a ready means of identifying the families, genera and species of our Vertebrate Animals. In deference to the uniform experience of botanists, and in view of the remarkable success achieved by Dr. COUES, in the application of the method to Ornithology, the author has adopted the system of artificial keys.

To keep the book of a size convenient for field use, class and ordinal characters have been abbreviated, since they do not lie directly within the purpose of the work; generic characters have been confined to the "key," under the head of each family, while for specific characters, only such points have been generally retained, as are distinctive as well as descriptive. The same necessity has led to the suppression of many of the doubtful or nominal "species," which still encumber our systematic works, and to the omission of synonymy and references to authorities, excepting in cases of recent or original changes of nomenclature.

Use has been freely made of every available source of information, and it is believed that the present state of our knowledge is fairly represented. A list of the principal papers which have proved useful in the preparation of this work may be found on page 363.

The writer is under deep personal obligations for assistance, criticism and advice, to many persons, among whom I may especially mention Dr. ELLIOTT COUES, Prof. E. D. COPE, Dr. THEODORE GILL, Prof. H. E. COPELAND, Mr. E. W. NELSON, Mr. B. H. VAN VLECK, Mr. C. H. GILBERT and Dr. A. W. BRAYTON.

The present edition is from the same stereotype plates as the second. From the latter it differs in some changes of nomenclature, in the correction of occasional errors, and in other minor respects. A few additional species are included in the Addenda.

In the preparation of the second edition, it was "found necessary to entirely recast the account of the Fishes, in order to include the results of recent investigations in that department. The author has availed himself of this opportunity to substitute for the artificial keys in the previous edition, a series of generic diagnoses, which, while serving the purpose of a 'key,' also serve to express the true relations of the species." The author regrets that this change can not in the present edition be extended to all the groups included in the work, as well as to the Fishes.

D. S. J.

NOTE TO FOURTH EDITION.

This edition is from the same stereotype plates as the second (1878) and third (1880). In the groups other than the Fishes, the nomenclature has been changed in several places. It is now brought fully up to date, so far as it is possible to do so without alteration in the arrangement of the genera or insertion of additional matter. The account of the Fishes remains exactly as in the third edition. Changes in this group have been deemed less necessary, as those especially interested will find an account of the recent additions and modifications in Jordan & Gilbert's Synopsis of the Fishes of North America, published by the Smithsonian Institution in 1883. D. S. J.

BLOOMINGTON, IND, April, 1884.

SIGNS, ABBREVIATIONS, ETC., EXPLAINED.

I.—Mammals.

i.=Incisor teeth.
c.=Canines.
pm.=Premolars.
m.=Molars.

Thus "i. $\frac{2\text{-}2}{1\text{-}1}$" indicates two incisor teeth on each side in the upper jaw, and one on each side in the lower.

"Toes 5–4" implies fore feet five-toed, hind feet four-toed.

Other signs are as used in Birds.

II.—Birds.

L.=Length in inches (along back from tip of bill to end of longest tail feather); thus, "L. 7¼" means, length 7¼ inches.

E.=Extent (spread of wing) measured in inches.

W.=Length of wing (from bend of closed wing—carpal joint—to tip of longest feather) in inches.

T.=Length of tail in inches (*i.e.*, *actual* length of the longest tail feather.)

B.=Length of bill in inches (measured along culmen from tip to frontal feathers.)

Hd.=Length of head in inches (measured with dividers from base of bill to nape.)

Ts.=Length of tarsus in inches (measured in front.)

Tcl.=Length of middle toe with its claw.

The measurements given in the descriptions are understood to represent a fair *average adult male;* a variation of one-sixth, or more, in *absolute* length is nothing unusual; *relative* lengths, as of wings and tail, are much more constant. To save space I have preferred to say "L. 6," to saying "L. 5½ to 6½."

♂=Male.

♀=Female.

$>$ = More than, longer than, or more than equivalent to.

$<$ = Less than, in its various senses.

$=$ = Sign of equivalence.

The toes are numbered 1, 2, 3, 4; 1 being the hind toe, or hallux; 2 the inner anterior toe; 3 the middle toe; and 4 the outer toe.

III.—Reptiles.

L.=Length in inches.

Sc. or *Scales*=Number of longitudinal rows of scales exclusive of the ventral series.

G.=Number of ventral plates, or gastrosteges, counted along the belly, from the throat to the vent. The figures given in the descriptions are intended to be *average*, the actual number being quite variable.

U.=Number of pairs of sub-caudal plates, or urosteges, counted from the vent to the tip of the tail.

IV.—Fishes.

D.=Dorsal fin.
2*d D.*=Second dorsal fin.
P.=Pectoral fins.
V.=Ventral fins.
A.=Anal fin.
C.=Caudal fin.
B.=Branchiostegals.

Roman numerals used with the above abbreviations indicate the number of *spines* or *inarticulate* rays in a fin. *Arabic* numerals indicate the number of *soft rays*. In a fin containing both spines and soft rays, a *comma* (,) separating the numerals indicates that the two kinds of rays are *continuous*, or more or less connected. A *dash* (—) indicates their *separation*. Thus, "D, X, 12," describes a single dorsal fin with 10 spines and 12 soft rays; "D, X — 12," indicates two dorsal fins—the first of 10 spines, the second of 12 soft rays; "D, X — I, 12," would indicate the presence of a single spine in the second dorsal.

The posterior soft ray of the dorsal and anal fins is usually split to the base. It should be counted as *one* ray and not as *two*.

Lat. l.=Lateral line, *i.e.*, the number of scales contained in its course. When the lateral line is obsolete, "lat. l." signifies the number of scales in a row from the head to the base of the caudal fin. Thus, "lat. l. 36" means that there are 36 scales in a row along the sides from the head to the caudal.

In all cases the number of rays or scales, as given in the descriptions, is intended to represent a fair average, and a variation of one-sixth, or even more, in either direction need not surprise the student. Generally the spines and scales are more constant in their numbers than the soft rays, and the fewer of either, the less variable.

Depth in length=The greatest depth of the body as contained in the distance along the side from the snout to the base of the caudal.

Head in length=The distance from the snout along the cheeks to the extremity of the opercle, as contained in the distance from the snout to the base of the caudal.

Eye in head=Its longitudinal diameter as contained in the length of the side of the head.

As above stated, these measurements, as given in the descriptions, are *intended* to be the *average* of *living adults*, and must be applied to young specimens or preserved ones with caution.

Young fishes are always much more elongated than adults, and the eye is proportionally much larger.

A fin is said to be "*long*" when it has a long base, or is many-rayed. A "*high*" fin is one in which the individual rays are elongated.

PRINCIPAL ABBREVIATIONS OF NAMES OF AUTHORS CITED IN THIS VOLUME.

Ag.=Agassiz.
Allen=J. A. Allen.
Auct.=Auctorum (of Authors.)
Aud.=Audubon.
Aud. & Bach. = Audubon & Bachman.
Bd.=Baird.
B. & G.—Baird & Girard.
Bartr.—Bartram.
Beauv.=Palisot de Beauvais.
Bl. & Schn.=Bloch & Schneider.
Bodd.=Boddaert.
Bon., *or Bp.*=C. L. Bonaparte.
Brev.=Brevoort.
Brünn.=Brünnich.
Cab.=Cabanis.
Cass.=Cassin.
Coop.=Cooper.
Cuv.=Cuvier.
C. & V.=Cuvier and Valenciennes.
Daud.=Daudin.
Dek.=Dekay.
Desm.=Desmarest.
Dum.=Duméril.
Erxl.=Erxleben.
Fitz.=Fitzinger.
Forst.=Forster.
Grd.=Girard.
Gm., *or Gmel.*=Gmelin.
Gray (*Birds*)=G. R. Gray.
Gray (*Mam.& Rept.*)=J.E.Gray.
Gthr.=Günther.
Hald.=Haldeman.
Holbr.=Holbrook.
Illig.=Illiger.
Kirt.=Kirtland.
Lac.=Lacepède.
Lafr.=Lafresnaye.
Lath.=Latham.
Latr.=Latreille.
Lawr.=Lawrence.
LeC.=LeConte.
Less.=Lesson.
LeS.=LeSueur.
Licht.=Lichtenstein.
L.=Linnæus.
Mitch.=Mitchill.
Nutt.=Nuttall.
Pall.=Pallas.
Raf.=Rafinesque.
Reich.=Reichenbach.
Rich.=Richardson.
Ridg.=Ridgway.
Sab.=Sabine.
Sav.=Savigny.
Schl.=Schlegel.
Scl.=Sclater.
H. Smith=Hamilton Smith.
Steph.=Stephens.
Stor.=Storer.
Strickl.=Strickland.
Sund.=Sundevall.
Sw.=Swainson.
Temm.=Temminck.
Towns.=Townsend.
Val.=Valenciennes.
Vieill., *or V.*=Vieillot.
Vig.=Vigors.
Wagl.=Wagler.
Walb.=Walbaum.
Wils.=Wilson.

⁂ Names of Authors not in the above list are usually written in full.

VERTEBRATE ANIMALS

OF THE

NORTHERN UNITED STATES.

VERTEBRATA.

(*The Vertebrates.*)

The Vertebrates are, in popular language, "animals with a back-bone." They are distinguished from all other animals, says Prof. Huxley, "by the circumstance that a transverse and vertical section of the body exhibits two cavities, completely separated from one another by a partition. The dorsal cavity contains the cerebro-spinal nervous system; the ventral, the alimentary canal, the heart, and, usually, a double chain of ganglia, which passes under the name of the 'sympathetic.' A vertebrated animal may be devoid of articulated limbs, and it never possesses more than two pairs. These are always provided with an internal skeleton, to which the muscles moving the limbs are attached."

Without further discussion of this great group of animals, we will proceed at once to the consideration of the classes. Of existing vertebrates, we here recognize eight classes. These are: — 1. MAMMALIA, or Mammals; 2. AVES, or Birds; 3. REPTILIA, or Reptiles; 4. BATRACHIA, or Batrachians; 5. PISCES, or True Fishes; 6. ELASMOBRANCHII, or Selachians; 7. MARSIPOBRANCHII, or Myzonts; 8. LEPTOCARDII, or Lancelets.

Of these classes, two, *Elasmobranchii* and *Leptocardii*, are represented by marine forms only, and do not, therefore, come within the scope of this treatise.

The relations of the classes of Vertebrates may be recognized by the following analysis, taken, in part, from Prof. Gill's "Arrangement of the Families of Fishes." Only the most obvious characters are here referred to, although others, less striking, are often of greater taxonomic value.

CLASSES OF VERTEBRATES.

* Respiration never performed after birth by means of branchiæ.

† Exoskeleton developed as hair (rarely obsolete); warm blood; heart with four cavities; diaphragm complete; two occipital condyles; viviparous; young developed from a minute egg, and nourished for a time by milk secreted in the mammary glands of the mother. . . . . MAMMALIA.

†† Exoskeleton developed as feathers; warm blood; heart with four cavities; diaphragm incomplete; a single occipital condyle; oviparous; young hatched from a comparatively large egg; no mammary glands. . . . . AVES.

††† Exoskeleton developed as scales, or bony plates; cold blood; heart with three cavities (four in *Crocodilia*); a single occipital condyle; oviparous (or rarely ovoviparous); young hatched from a rather large egg. . . . REPTILIA.

** Respiration performed by gills for a part, or the whole, of life; cold blood.

‡ Skull more or less developed, with the notochord not continued forwards beyond the pituitary body; brain differentiated and distinctly developed; heart developed and divided into at least an auricle and ventricle.

a. Skull well developed and with a lower jaw; nostrils paired.

b. No median rayed fins; limbs not developed as rayed fins, but, if present, having the same skeletal elements as in the higher vertebrates; skin usually naked; respiration in the adult chiefly, or entirely, accomplished by means of lungs, the branchiæ rarely persistent. . . . . . . BATRACHIA.

bb. Rayed fins present on median line of the body; limbs developed as rayed fins; at least one pair being always present; respiration by means of branchiæ throughout life; lungs not developed.

c. Membrane bones (operculum, etc.) developed in connection with the skull; gills free; the branchial openings a single slit on each side; exoskeleton usually of scales, or plates, never placoid; eggs small and numerous. . . . . PISCES.

cc. Skull without membrane bones; gills not free; the branchial openings slit-like, usually several in number; exoskeleton placoid, never of scales, but usually composed of calcified papillæ of various styles; eggs few and large. . ELASMOBRANCHII.

aa. Skull imperfectly developed and with no lower jaw; a single median nostril; paired fins undeveloped, with no shoulder girdle nor pelvic elements; gills purse-shaped; skin naked. . . MARSIPOBRANCHII.

‡‡ Skull undeveloped, with the notochord persistent and extending to the anterior end of the head; brain not distinctly differentiated; heart none. LEPTOCARDII.

Class I.—Mammalia.

(*The Mammals.*)

A Mammal is a warm-blooded, air-breathing vertebrate, having the skin more or less covered with hair; viviparous; embryo developed from a minute egg, and provided with an amnion and allantois; young nourished for a time after birth by milk, secreted in the mammary glands of the mother; respiration never by branchiæ, but after birth by lungs, suspended freely in the thoracic cavity, which is completely separated from the abdominal cavity by a muscular septum (the diaphragm); heart with four cavities; a complete double circulation. The peculiarities of the skeleton are too numerous to be noticed in this connection.

The following key to the Orders and Families of Mammals which occur within our limits (omitting the Seals and the Cetaceans, all our members of which groups are marine), is mostly taken from Prof. Gill's "Arrangement of the Families of Mammals." It has been thought best not to give here any separate account of the different orders, as, in the abundance of literature on that subject, it seems unnecessary.

ORDERS OF MAMMALIA.

* Young not born until of considerable size and nearly perfect development, deriving its nourishment, before birth, from the mother through the intervention of a placenta; a well developed corpus callosum. (MONODELPHIA.)

† Brain with a relatively large cerebrum, overlapping much, or all, of the cerebellum and olfactory lobes. (EDUCABILIA.)

‡ Anterior and posterior limbs and pelvis well developed; femur and humerus not exserted beyond the common integuments of the body.

a. Feet with developed claws; canines specialized; molars, one or more, sectorial, adapted for cutting; incisors $\frac{6}{6}$; chiefly carnivorous. . . Carnivora, A.

aa. Feet with hoofs; molars mostly with grinding surfaces; incisors various; no tusks; developed toes, four or fewer; chiefly herbivorous. . . Ungulata, B.

†† Brain with a relatively small cerebrum, leaving behind much of the cerebellum exposed, and, in front, much of the olfactory lobes. (Ineducabilia.)

b. Canine teeth present, in some form; incisors not $\frac{2}{2}$ nor $\frac{4}{2}$.

c. Anterior limbs adapted for flight; ulna and radius united; bones of hand and fingers much elongated, supporting a thin, leathery skin, extending along sides of body to the posterior limbs; mammæ pectoral. . . . Chiroptera, C.

cc. Limbs all adapted for walking; ulna and radius not united; hand normal; mammæ usually abdominal. . . . . . . Insectivora, D.

bb. No canine teeth; incisors $\frac{2}{2}$, rarely $\frac{4}{2}$, chisel shaped; limbs adapted for walking. . Rodentia, E.

** Young born when of very small size and incomplete development, never connected by a placenta to the mother; corpus callosum rudimentary. (Didelphia.) . Marsupialia, F.

A. FAMILIES OF CARNIVORA.

* Intestinal canal provided with a cœcum; feet digitigrade; toes 5–4.

† Teeth 28 to 30; head broad; snout short; claws sharp, retractile. . . . . Felidæ, 1.

†† Teeth 38 to 46; snout elongated; claws bluntish, nonretractile. . . . . Canidæ, 2.

** Intestinal canal without a cœcum; feet plantigrade, or, if not, toes 5–5.

‡ Teeth less than 40; body rather slender; feet often more or less perfectly digitigrade. . . . Mustelidæ, 3.

‡‡ Teeth 40 or 42; body stout; feet completely plantigrade.

a. Tail rudimentary; teeth 42; lower jaw with three true molars; body very large and heavy. . Ursidæ, 4.

aa. Tail well developed; teeth 40; lower jaw slender, with two true molars; body moderately stout. Procyonidæ, 5.

B. FAMILIES OF UNGULATA.

* Toes paired (artiodactylous); horns solid, deciduous; teeth 34 or 32. Cervidæ, 6.

C. FAMILIES OF CHIROPTERA.

* Snout not appendaged; tail inclosed in the membrane, or only the last joint exserted. . . . Vespertilionidæ, 7.

D. FAMILIES OF INSECTIVORA.

* No external ear; fore feet greatly enlarged—adapted for digging; limbs very short. . . . Talpidæ, 8.

** An external ear; feet normal; hind feet usually longest. Soricidæ, 9.

E. FAMILIES OF RODENTIA.

* Incisors $\frac{2}{2}$; tail well developed.

† Hair forming a fur, without spines.

a. Tail broad, flat and scaly; feet webbed; molars $\frac{4}{5}\cdot\frac{4}{5}$; body stout and heavy. . . . Castoridæ, 11.

aa. Limbs very short, about equal; fore claws much enlarged; large external cheek pouches; body thick-set and heavy; molars $\frac{4}{4}\cdot\frac{4}{4}$. . . . . . . Geomyidæ, 12.

aaa. Tail and hind legs excessively elongated, the latter adapted for leaping; molars $\frac{4}{3}\cdot\frac{4}{3}$. . Zapodidæ, 13.

aaaa. With none of the preceding combinations.

b. Molars $\frac{5 \cdot 5}{4 \cdot 4}$ or $\frac{4 \cdot 4}{4 \cdot 4}$; no foramen (as in the next); tail usually long and hairy; (squirrels, etc.) SCIURIDÆ, 10.

bb. Molars $\frac{2 \cdot 2}{2 \cdot 2}$ to $\frac{4 \cdot 4}{3 \cdot 3}$; zygomatic process of upper jaw with a foramen; (rats and mice). . . MURIDÆ, 14.

†† Fur with stiff spine-like bristles; toes with long, curved claws. . . . . . . SPALACOPODIDÆ, 15.

** Incisors $\frac{4}{2}$; the middle upper incisors large, grooved, the outer ones small; teeth 28; tail very short; ears long.
LEPORIDÆ, 16.

F. FAMILIES OF MARSUPIALIA.

* Tail long, prehensile, nearly naked; feet plantigrade; incisors $\frac{5 \cdot 5}{4 \cdot 4}$; teeth 50. . . . . . DIDELPHIDIDÆ, 17

ORDER A.—CARNIVORA.

(*The Flesh-Eaters or Feræ.*)

FAMILY I.—FELIDÆ.

(*The Cats.*)

Digitigrade Carnivora with the toes 5–4; claws compressed, very sharp, retractile; palms and soles hairy, with naked pads under each toe and the ball of the foot. Body compact; head short, broad and rounded. Dentition i. $\frac{3 \cdot 3}{3 \cdot 3}$; c. $\frac{1 \cdot 1}{1 \cdot 1}$; pm. $\frac{3 \cdot 3}{2 \cdot 2}$ or $\frac{2 \cdot 2}{2 \cdot 2}$; m. $\frac{1 \cdot 1}{1 \cdot 1} = 30$ or 28; canine teeth long and sharp; teeth all strongly trenchant; tongue with short, retrorse papillæ. General aspect cat-like. A well-known group comprising about fifty species, found in all parts of the world excepting Australia and its islands.

* Premolars $\frac{3 \cdot 3}{2 \cdot 2}$, anterior upper one very small; tail at least half as long as the body (exclusive of head and neck); fur compact and glossy; ears not tufted. . . . . . FELIS, 1.

** Premolars $\frac{2 \cdot 2}{2 \cdot 2}$, (anterior upper one wanting); tail less than half length of body proper; ears triangular, tufted. LYNX, 2.

1. FELIS, Linnæus. Cats.

1. ***F. concolor,*** L. American Panther. Cougar. Puma. Above tawny brownish yellow; a wash of darker along dorsal line; dirty white below; large; body 4½ feet long. Whole continent of America, N. to lat. 50° to 60°.

2. LYNX, Rafinesque. Wild Cats.

1. ***L. canadensis,*** (Desm.) Raf. Canada Lynx. Feet very large, densely furred beneath in winter, concealing the small, naked patches; tail black at tip; no distinct bars on inner side of legs; much larger than the next, with larger feet and longer fur. N. A.

2. ***L. rufus,*** (Guldenstädt.) Raf. American Wild Cat. Inner sides of legs with dark cross bands; tail with a black patch at end above, preceded by half rings. U. S. and northward.

FAMILY II.—CANIDÆ.

(*The Dogs.*)

Digitigrade Carnivora with blunt, non-retractile claws; toes 5–4. Muzzle more or less elongated. Dentition typically i. $\frac{3\cdot3}{3\cdot3}$; c. $\frac{1\cdot1}{1\cdot1}$; pm. $\frac{4\cdot4}{4\cdot4}$; m. $\frac{2\cdot2}{3\cdot3}=42$; canines large, rather blunt. Both hemispheres.

* Tail comparatively short; upper incisors distinctly lobed; pupil circular. . . . . Canis, 1

** Tail comparatively long and bushy; upper incisors scarcely lobed; pupil elliptical; body more slender.

† Tail with soft fur and long hair; muzzle long. . Vulpes, 2.

†† Tail with a concealed mane of stiff hairs, and without soft fur; muzzle shorter. . . . . . Urocyon, 3.

1. ***CANIS,*** Linnæus. Wolves.

1. ***C. lupus,*** L. Wolf. Color exceedingly variable; northward it is chiefly gray, southward more and more blackish and reddish, till in Florida black wolves predominate, and in Texas red ones. N. A. and northern parts of the Old World. (*C. occidentalis*, Auct.)

2. ***VULPES,*** Brisson. Foxes.

1. ***V. vulpes,*** Linnæus. Red Fox. Cross Fox. Silver Fox. Black Fox. Chiefly red, with black feet and ears; tip of tail white. A single species, widely variable in color, as indicated by the common names. N. Am. Europe (*V. fulvus*, Auct.)

3. ***UROCYON,*** Baird. Gray Foxes.

1. ***U. cinereo-argentatus,*** (Schreb.) Coues. Gray Fox. Chiefly gray; fur dusky or fulvous, hairs hoary at tip; tip of tail usually dark. Penn. S., W. to the Pacific.

FAMILY III.—MUSTELIDÆ.

(The Weasels.)

Carnivora either plantigrade or digitigrade, with the toes 5–5. Molars $\frac{1}{2}\cdot\frac{1}{2}$ (rarely $\frac{1}{1}\cdot\frac{1}{1}$); the upper and the last lower one tubercular; no cœcum. Most species provided with glands near the anus which secrete a fetid liquid. Some are strictly carnivorous while others are rather omnivorous. Size usually medium or small. They are found in all parts of the earth excepting the Australian region.

* Last or true molar of upper jaw short, small, transversely elongated; toes short; claws retractile. (Mustelinæ.)

† Teeth 38; body slender; feet digitigrade; tail rather long; lower first molar with an internal tubercle. . Mustela, 1.

†† Teeth 34; body slender; feet digitigrade; tail usually long; sectorial tooth without internal tubercle. . PUTORIUS, 2.

††† Teeth 38; body stout; feet sub-plantigrade; tail as long as head, very full and bushy. . . . . GULO, 3.

** True molar of upper jaw very large, sub-triangular, tubercular; fore claws much lengthened, for digging. (MELINÆ.)

a. Body short and stout; tail very short; teeth 32. TAXIDEA, 4.

*** True molar of upper jaw quadrangular, wide, very large, with an outer cutting ridge; claws non-retractile, fore claws lengthened, fossorial. (MEPHITINÆ.)

b. Snout pointed; colors black and white; fetid glands highly developed; teeth 34. . . . . MEPHITIS, 5.

**** True molar large, quadrate; teeth 36; body elongated; toes palmate, adapted for swimming. (LUTRINÆ.) LUTRA, 6.

1. MUSTELA, Linnæus. MARTENS.

1. ***M. americana,*** Turton. SABLE. PINE MARTEN. Chiefly reddish yellow, clouded with black; legs and tail, blackish; length less than two feet. Maine to Oregon, and northward.

2. ***M. pennantii,*** Erxleben. FISHER. BLACK CAT. Color, variable; belly, legs, tail, and hind parts chiefly black; length more than two feet. Northern N. A.

2. PUTORIUS, Cuvier. WEASELS.

1. ***P. vulgaris,*** Cuvier. LEAST WEASEL. Liver-brown, white beneath; usually white in winter; tail never really black at tip; body 6 to 7 inches long. N. U. S. and northward, also Old World.

2. ***P. ermineus,*** Cuvier. COMMON WEASEL. ERMINE. Colors various; tip of tail usually black; white in winter, northward. Length of body 8 to 11 inches.

N. Am. and Old World, abundant. (*P. noveboracensis*, *cicognanii*, etc., of authors.)

3. ***P. vison,*** Gapper. Common Mink. Brownish chestnut; tail black or nearly so; length of body 15 to 20 inches. N. A.

3. *GULO,* Storr. Wolverines.

1. ***G. luscus,*** (L.) Sabine. Wolverine. Dark brown; legs and beneath black. N. U. S. and N.

4. *TAXIDEA,* Waterhouse. Badgers.

1. ***T. americana,*** (Bodd.) Baird. American Badger. Chiefly grayish. Wisconsin, N. and W.

5. *MEPHITIS,* Cuvier. Skunks.

1. ***M. mephitica,*** (Shaw) Baird. Common Skunk. Usually black with tip of tail, dorsal stripes and nuchal patch white; sometimes all black or even nearly all white. Mexico to Arctic regions, an abundant and familiar species. (*M. chinga*, Tiedemann.)

6. *LUTRA,* Linnæus. Otters.

1. ***L. canadensis,*** Sabine. American Otter. Liver-brown; length 4½ feet. U. S.

FAMILY IV.—URSIDÆ.

(*The Bears.*)

Plantigrade Carnivora having the body thick and clumsy. Tail rudimentary. Teeth 42; molars broad and tuberculated, according with the omnivorous diet. Species few and widely distributed,—in North America, there are probably but three, although many have been described, the Polar Bear *Thalarctos maritimus*, the Grizzly Bear, *Ursus horribilis*, and the following.

1. **URSUS,** Linnæus. Bears.

1. ***U. americanus,*** Pallas. Brown, Black or Cinnamon Bear. Color, size, etc., exceedingly variable, but the several forms or varieties intergrade perfectly. N. Am.

FAMILY V.—PROCYONIDÆ.

(*The Raccoons.*)

Plantigrade Carnivora of moderate size, with the body comparatively slender and the tail well developed. Teeth 40. Snout more or less elongated; no cœcum. Genera two,—*Nasua*, the Coatimundi of Mexico, and the following, all American.

1. **PROCYON,** Storr. Raccoon.

1. ***P. lotor,*** (L.) Storr. Common Raccoon. "Coon." Grayish white; hairs black-tipped; tail with black rings. U. S.; abundant.

ORDER B.—UNGULATA.

(*The Hoofed Mammals*).

FAMILY VI.—CERVIDÆ.

(*The Deer*).

Horns deciduous, solid, developed from the frontal bone, more or less branched, covered at first by a soft, hairy integument, known as "velvet"; when the horns attain their full size, which they do in a very short time, there arises at the base of each a ring of tubercles known as the "burr;" this compresses and finally obliterates the blood-vessels supplying the velvet, which dries up and is stripped off, leaving the bone hard and insensible; the horns or "antlers" are shed annually, the separation of the "beam" from its "pedicel" taking place just below the burr; the antlers are wanting in the female (excepting in the Reindeer) but they are usually present in the male. Herbivorous; stomach in four divisions, of the ordinary ruminant pattern. Dental formula, i. $\frac{0}{3}\cdot\frac{0}{3}$; c. (usually) $\frac{0}{1}\cdot\frac{0}{1}$; pm. $\frac{3}{3}\cdot\frac{3}{3}$; m. $\frac{3}{3}\cdot\frac{3}{3}$. A widely distributed family.

* Horns (in males only) very broadly palmated to the tip; nose very broad, entirely hairy except a small naked spot between nostrils. . . . . Alce, 1.

** Horns (in both sexes) broadly palmated at tip; nose entirely hairy. . . . . Rangifer, 2.

*** Horns (in males only) rounded more or less; rarely sub-palmated; nose naked and moist.

† Horns large, curving backward, with the snags all directed forward, one of them immediately above the burr; tail very short; hoofs broad and rounded; size very large. Cervus, 3.

†† Horns smaller, curving forward, the first snag short, at some distance above the base, and like the others curving upward; tail rather long; hoofs rather elongate; size smaller. . . . . Cariacus, 4.

1. ***ALCE,*** Hamilton Smith. Elks.

1. ***A. americanus,*** Jardine. Moose. American Elk. Largest of our *Cervidæ*, reaching the size of a horse. Maine and N. N. Y. to Oregon and N.

2. ***RANGIFER,*** Hamilton Smith. Reindeer.

1. ***R. caribou,*** Aud. & Bach. Woodland Caribou. Reindeer. Maine to Hudson's Bay and Lake Superior; perhaps the same as the Reindeer of Europe (*R. tarandus*.)

3. ***CERVUS,*** Linnæus. Deer.

1. ***C. canadensis,*** Erxleben. "American Elk." Wapiti. Chestnut red, grayish in winter; size nearly equal to that of the Moose. Alleghany region of Penn. and Va., Wis. (near Green Bay, *Van Vleck,*) Yellowstone region and W.

4. ***CARIACUS,*** Gray. Red Deer.

1. ***C. virginianus,*** (Bodd.) Gray. Virginia Deer. Red Deer. General color chestnut red, grayish in winter. Maine to Rocky Mountains and S., abundant in many regions.

ORDER C.—CHIROPTERA.

(*The Bats.*)

FAMILY VII.—VESPERTILIONIDÆ.

(*The Ordinary Bats.*)

Insectivorous Bats with the snout not appendaged, or merely with two lateral excrescences. Wing membranes ample. Tail completely enclosed in the interfemoral membrane or only the last joint exserted.

* Cheeks without excrescences; ears moderate.

† Incisors $\frac{2}{3}\cdot\frac{2}{3}$. . . . . Vespertilio, 1.

†† Incisors $\frac{1}{3}\cdot\frac{1}{3}$. . . . . Atalapha, 2.

** Cheeks with two large excrescences; ears excessively large, an inch high; teeth 36; i. $\frac{2}{3}\cdot\frac{2}{3}$. . . Corynorhinus, 3.

1. ***VESPERTILIO,*** Linnæus. Typical Bats.

> *Scotophilus,* Leach.

* Teeth 38; molars $\frac{6}{6}\,\frac{6}{6}$; species with thin wings and ears. (*Vespertilio.*)

1. ***V. subulatus,*** Say. Little Brown Bat. Face

small, fox-like, with high forehead and pointed snout; ears large, oval, twice the height of the erect tragus; wings naked; interfemoral membrane naked except at base, face whiskered; color dull olive-brown. L. 3; E. 9; T. $1\frac{1}{2}$. N. Am.; abundant every where. A small and very variable species. (*V. lucifugus*, Le C.)

** Teeth 36; molars $\frac{5\cdot5}{6\cdot6}$. (*Vesperides.*)

2. ***V. noctivagans,*** LeC. Silver Black Bat. Tragus almost as broad as high, scarcely one-third height of ear; femoral membrane entirely though scantily furred; fur long and silky, black, usually with silvery tips to the hairs. L. $3\frac{1}{2}$; E. 12; T. $1\frac{1}{2}$. U. S. generally.

*** Teeth 34; molars $\frac{5\cdot5}{5\cdot5}$; stouter species, with thicker wings and more leathery ears. (*Vesperugo.*)

3. ***V. georgianus,*** F. Cuvier. Georgia Bat. Tragus slender, erect, half the height of the auricle; upper incisors about equal in size; femoral membrane one-third furred; dark reddish brown, brighter forwards. L. 3; E. 9; T. $1\frac{1}{2}$. Maine to Texas; chiefly southward.

**** Teeth 32; molars $\frac{4\cdot4}{5\cdot5}$; stout species. (*Vesperus.*)

4. ***V. fuscus,*** Beauv. Carolina Bat. Dusky Bat. Tragus never pointed, nearly half as high as auricle; wings naked; interfemoral membrane furred at base; ears more or less turned outward; upper lateral incisors small, scarcely visible. L. 3 to 4; E. 12; T. $1\frac{1}{2}$. U. S.; a widely diffused species. (*V. carolinensis*, Geoff. St. Hilaire.)

2. *ATALAPHA,* Rafinesque. Red Bats.

* Teeth 30; molars $\frac{4\cdot4}{5\cdot5}$; upper incisors small; wings naked and interfemoral membranes nearly so. (*Nycticejus.*)

1. ***A. crepuscularis,*** (Le C.) Coues. Twilight Bat. Ears small, wide apart; a small wart above eye; fur

rather scanty; dark fawn color above, passing into brownish below; L. $3\frac{1}{3}$; E. 9; T. $1\frac{1}{3}$. Penn. to Mo., and S.W.

** Teeth 32; molars $\frac{5}{5}\cdot\frac{5}{5}$; upper incisors stout; interfemoral membrane hairy above, and wings with furry patches (*Lasiurus.*)

2. ***A. noveboracensis,*** (Erxl.) Coues. RED BAT. Fur long and silky, reddish brown, mostly white at tip; lips and ears not edged with black; a whitish tuft at base of thumb; L. $3\frac{3}{4}$; E. 12; T. $1\frac{3}{4}$. U. S., every where. An abundant species, readily known by its reddish color.

3. ***A. cinereus,*** (Beauv.) Coues. HOARY BAT. Rich chocolate-brown, overlaid with white; lips and ears marked with black; L. 5; E. 14; T. $2\frac{1}{4}$. U. S., rather northward, rare. (*V. pruinosus*, Say.)

3. CORYNORHINUS, Harrison Allen. BIG-EARED BATS.

1. ***C. macrotis,*** (Le C.) H. Allen. BIG-EARED BAT. Blackish, fur soft and long; L. $3\frac{1}{2}$; E. 11; T. $1\frac{3}{4}$. Va. to Missouri region and S.

ORDER D.—INSECTIVORA.

(The Insect Eaters.)

FAMILY VIII.—TALPIDÆ.

(The Moles.)

Body stout, thick, and clumsy, without visible neck. Eyes rudimentary, sometimes concealed. No external ears. Limbs very short; feet greatly expanded and provided with strong claws, adapted for digging; anterior limbs much larger than posterior. Scapula as long as humerus and radius together. Canines usually present.

Fur compact, soft and velvety. Found on both continents.

* Nose elongated, not fringed; nostrils superior or lateral; tail short.

† Teeth 36; nostrils partly superior; tail nearly naked. SCALOPS, 1.

†† Teeth 44; nostrils lateral; tail densely hairy. SCAPANUS, 2.

** Nose elongated, fringed at end with a circle of long fleshy projections; nostrils terminal; tail nearly as long as body; teeth 44. . . . . CONDYLURA, 3.

1. SCALOPS, Cuvier. SHREW MOLES.

1. ***S. aquaticus,*** (L.) Fischer. COMMON MOLE. Dark plumbeous, paler below; feet full webbed; eyes not covered by skin. E. U. S.; an abundant and well known species.

2. ***S. argentatus,*** Aud. & Bach. PRAIRIE MOLE. Silvery plumbeous; said to be larger and more silvery than the preceding. Ohio and W., chiefly in the prairie region.

2. SCAPANUS, Pomel. HAIRY-TAILED MOLES.

1. ***S. breweri,*** (Bach.) Pomel. HAIRY-TAILED MOLE. Dark plumbeous, with brown gloss. E. U. S.

3. CONDYLURA, Illiger. STAR-NOSED MOLES.

1. ***C. cristata,*** (L.) Desmarest. STAR-NOSED MOLE. Blackish. U. S., chiefly northerly, from the Atlantic to the Pacific.

FAMILY IX.—SORICIDÆ.

(The Shrews.)

Mouse-like Insectivora, with the eyes and external ears distinctly developed. Muzzle elongated. Feet normal, not fossorial; the fore-feet mostly smaller than the hind ones. Teeth $\frac{16 \text{ to } 20}{12}$, no canines. The most abundant and widely distributed family of the Insectivora. The assumed specific distinctions in this family are utterly worthless, and it is at present impossible to characterize the species. The following are the best known. (See Addenda.)

* Ears large; auricle directed backwards; tail about as long as the body; upper anterior incisors with a second basal hook, and an angular process on the inner side near the point. Sorex, 1.

** Ears small, concealed by the fur; tail not longer than head; auricle directed forwards; upper anterior incisor without above-mentioned hook and process. . . Blarina, 2.

1. SOREX, Linnæus. Shrews.

1. ***S. platyrhinus,*** (Dek.) Wagner. Common Shrew. A small, long-nosed, large-eared species, of a chestnut color, having the tail much shorter than head and body; said to be abundant in the Eastern and Middle States.

2. ***S. cooperi,*** Bach. Western Shrew. Still smaller; color light chestnut; tail nearly as long as head and body. New England, N. and W.

2. BLARINA, Gray. Short-Tailed Shrews.

1. ***B. brevicauda,*** (Say) Baird. Mole Shrew. Tail less than one-third length of head and body; color brownish gray. E. U. S., the common species.

ORDER E.—RODENTIA.

(*The Rodents or Glires.*)

FAMILY X.—SCIURIDÆ.

(*The Squirrels.*)

Rodents with the molars $\frac{5\cdot5}{4\cdot4}$ (upper anterior often deciduous), the last 4 of nearly equal size; a distinct postorbital process of frontal bone; tibia and fibula distinct. Species of rather small size, widely distributed. The variations in color, etc., are extremely great, and the number of well-defined species is very much less than was once supposed.

* A densely furred membrane extending along the sides between the anterior and posterior limbs; tail depressed, flattened, densely furred; permanent molars 5–5 above. SCIUROPTERUS, 1.

** Sides without membrane for "flying."

† No cheek pouches; tail bushy, at least as long as body; ears long; no black stripes along the back. . . SCIURUS, 2.

†† Cheek pouches present.

‡ Back with 3 to 5 distinct black stripes; tail shorter than body, not bushy; cheek pouches well developed. TAMIAS, 3.

‡‡ Not as above; body rather slender, squirrel-like; cheek pouches well developed; claw of thumb rudimentary or wanting. . . . . SPERMOPHILUS, 4.

‡‡‡ Body large, thick-set, depressed; cheek pouches shallow; thumb rudimentary, armed with a small flat nail, not a claw; soles naked. . . . ARCTOMYS, 5.

1. SCIUROPTERUS, F. Cuvier. FLYING SQUIRRELS.

< *Pteromys*, Cuvier.

1. **S. volucella,** (Pall.) Geoff. COMMON FLYING SQUIRREL. Yellowish brown, creamy white below. N. Am., abundant. (*P. volucella*, etc., authors.)

2. SCIURUS, Linnæus. SQUIRRELS.

1. **S. niger,** Linn. FOX SQUIRREL. Upper molars permanently 4; tail very large and bushy; general color rusty gray, varying from almost white, through various shades of rusty red to jet black, the latter color rare northward, reddish and orange shades predominating westward; L. 26; T. 14. E. U. S., very abundant in the

Mississippi region. Leading varieties are: var. *niger*, the Southern form, gray to black with the ears and nose white; var. *cinereus*, the Eastern form, with short ears, scarcely longer than the fur; and var. *ludovicianus*, the Western form, with high ears and a prevailing tinge of orange red.

2. **S. carolinensis,** Auct. Gray Squirrel. Black Squirrel. Upper molars 5; varies from grizzly yellowish gray to pure jet black; L. 24; T. 13. N. Am., E. of the plains, abundant.

3. **S. hudsonius,** Pallas. Red Squirrel. Chickaree. Chiefly rusty red, back with a wash of brighter red; L. 14; T. 6½. N. Am., rather northerly; abundant.

3. TAMIAS, Illiger. Ground Squirrels.

1. **T. striatus,** (L.) Baird. Chipmunk. Ground Squirrel. Back and sides with five black stripes; L. 11; T. 4½. Maine to Va., and westward; abundant.

4. SPERMOPHILUS, Cuvier. Gophers.

1. **S. tridecemlineatus,** (Mitch.) Aud. & Bach. Striped Gopher. Dark brown, with light stripes alternating with lines of dots, about thirteen in all; L. 10; T. 4. Prairies; Ark. to the Saskatchawan.

2. **S. franklini,** (Sab.) Rich. Gray Gopher. Yellowish gray, mottled with brown; L. 15; T. 5½. Prairies; Ill. and northward.

5. ARCTOMYS, Schreber. Marmots.

1. **A. monax,** (L.) Gmel. Woodchuck. Ground Hog. Grizzly gray, varying to chestnut and blackish. Hudson's Bay to Va., and westward; common.

FAMILY XI.—CASTORIDÆ.

(*The Beavers.*)

Aquatic Rodents of large size, having the molars rootless, $\frac{4\cdot4}{4\cdot4}$, or $\frac{5\cdot5}{4\cdot4}$; fore feet with five distinct toes and claws; tibia and fibula distinct; no postorbital process. A small family, containing but two existing genera, *Haplodontia* of our N.W. coast, and *Castor*.

* Molars 4–4 above; hind feet webbed; tail broad, flat, and scaly. CASTOR, 1.

1. **CASTOR,** Linnæus. BEAVERS.

1. ***C. fiber,*** L. BEAVER. Mexico to the Polar Sea; now being rapidly exterminated. (*C. canadensis*, Kuhl.)

FAMILY XII.—GEOMYIDÆ.

(*The Pouched Gophers.*)

Cheek pouches large and distinct, opening outside of the mouth. Molars $\frac{4\cdot4}{4\cdot4}$; incisors large and thick; skull heavy; temporal bones enormously developed. Limbs about equal, the fore claws, five in number, very large; tibia and fibula united. Body thick-set and clumsy.

Genera two, *Geomys* and *Thomomys*, all North American, and chiefly inhabiting the central plains; habits nocturnal and subterranean.

* A large groove near the middle of each upper incisor; crown of molars elliptical. . . . . . GEOMYS, 1.

1. **GEOMYS,** Rafinesque. POUCHED GOPHERS.

1. ***G. bursarius,*** (Shaw) Rich. POCKET GOPHER. Reddish brown, with plumbeous tinge. Prairies, Wis. and Ills., westward.

FAMILY XIII.—ZAPODIDÆ.

(*The Jumping Mice.*)

Hind legs greatly elongated, adapted for taking long leaps; fore legs short. Tail very long. Molars $\frac{4\cdot4}{3\cdot3}$;

tibia and fibula united. Contains, probably, but a single species, inhabiting the Northern U. S., related to the Old World Jerboas.

1. ***ZAPUS,*** Coues JUMPING MICE.

= *Jaculus*, Wagler.

1. ***Z. hudsonius,*** (Zimmermann) Coues. Yellowish brown. U. S., chiefly northward; variable.

FAMILY XIV.—MURIDÆ.

(*The Mice.*)

Incisors $\frac{2}{2}$; molars usually $\frac{3\cdot3}{3\cdot3}$; anteorbital foramen a vertical slit, widening above and bounded externally by a broad plate of the upper maxillary; coronoid and condyloid processes of lower jaw well developed. A large family, found in all parts of the globe, some of the species (*Mus*) being cosmopolitan, having accompanied man in his migrations through the ages; all are of small size, the muskrat being one of the largest, and many are smaller than any other quadrupeds, except the Shrews.

* Incisors laterally compressed; molars rooted. (MURINÆ.)

† Molars with three tubercles in transverse series; soles naked; tail long, scaly; (Old World species, introduced in America.) MUS, 1.

†† Molars complicated, with two tubercles in transverse series; soles usually hairy; (New World species.)

a. Rat-like; size large; ears large, rarely naked. NEOTOMA, 2.

aa. Mouse-like; size small.

b. Incisors not grooved; ears very large; feet and lower parts usually white. . . . HESPEROMYS, 3.

bb. Size very small; upper incisors grooved longitudinally along their anterior surface. . OCHETODON, 4.

** Incisors very broad; molars rootless (except in *Evotomys*).

‡ Tail not specially compressed; teeth not grooved.

c. Molars rooted; coronoid process of lower jaw, not reaching level of condyle; ears overtopping the fur. EVOTOMYS, 5.

cc. Molars rootless; coronoid process as high as condyle; ears more or less concealed. . . . ARVICOLA, 6.

‡‡ Upper incisors grooved; root of lower incisor ending abruptly opposite the last molar; ears large. SYNAPTOMYS, 7.

‡‡‡ Tail scant-haired, vertically flattened; hind feet partly webbed; size large. . . . . . FIBER, 8.

1. **MUS,** Linnæus. OLD WORLD RATS AND MICE.

1. **M. decumanus,** Pallas. BROWN OR NORWAY RAT. Tail nearly an inch shorter than head and body, grayish brown above; paler below; feet dusty white; fur mixed with stiff hairs; cosmopolitan; introduced into America about 1775, and now the commonest species.

2. **M. rattus,** L. BLACK RAT. Tail not shorter than head and body; sooty black, plumbeous below; feet brown; introduced about 1544, but now being supplanted by the preceding.

3. **M. alexandrinus,** Geoff. ROOF RAT. WHITE-BELLIED RAT. Introduced in the Southern States.

4. **M. musculus,** L. COMMON HOUSE MOUSE. Cosmopolitan; every where too well known.

2. **NEOTOMA,** Say. & Ord. WOOD RATS.

1. **N. floridana,** S. & O. WOOD RAT. Tail scantily hairy, scarcely as long as body without head; feet entirely white; L. 14; T. 6, or less. S. U. S., N. to Mass. and Ills.

3. **HESPEROMYS,** Waterhouse. WHITE-FOOTED MICE.

* Fur soft and glossy; lower parts white; soles naked, or slightly hairy; tail closely hairy; ears large. (*Vesperimus.*)

1. **H. leucopus,** (Raf.) LeC. DEER MOUSE. WHITE-

FOOTED MOUSE. Yellowish brown; tail distinctly bicolor, about as long as head and body; hind feet more than $\frac{3}{4}$ inch. N. Am.; abundant.

2. ***H. michiganensis,*** (Aud. & Bach.) Wagner. MICHIGAN MOUSE. Tail little longer than body without head, bicolor; hind feet less than $\frac{3}{4}$ inch; dark brown; a darker dorsal band; L. 3, or less, to base of tail. Upper Miss. Valley to Mich., etc.

3. ***H. aureolus,*** (Aud. & Bach.) Wagner. RED MOUSE. Yellowish cinnamon, bright especially on ears; belly not pure white. Pa. to Ills., and S.

** Soles naked; tail scant-haired. about as long as head and body; ears small. (*Oryzomys.*)

4. ***H. palustris,*** (Harlan) Baird. RICE-FIELD MOUSE. Blackish and ashy above, becoming paler below; fur harsh, but compact; a large rat-like species. S. States, N. to N. J. and Kas.

4. ***OCHETODON,*** Coues. HARVEST MICE.

< *Reithrodon*, Baird.

1. ***O. humilis,*** (Aud. & Bach.) Coues. HARVEST MOUSE. Tail shorter than head and body; appearance decidedly mouse-like. U. S., southerly, N. to Iowa.

5. ***EVOTOMYS,*** Coues. LONG-EARED MICE.

< *Arvicola*, Bd.

1. ***E. rutilus*** (Pall.) var. ***gapperi,*** (Vigors) Coues. LONG-EARED MOUSE. Color chestnut; ears prominent; a brownish dorsal band; size of common mouse. Northern frontier, S. to Mass.

6. ***ARVICOLA,*** Lacepede. FIELD MICE.

* Back upper molar with two external triangles and a posterior crescent; middle upper molar with two internal triangles; front lower molar with three internal and two or three lateral triangles; size large. (*Myonomes.*)

1. ***A. pennsylvanicus,*** Ord. MEADOW MOUSE. Fore claws not longer than hind claws; tail one-third length of head and body, or more. U. S.; generally abundant.

** Back upper molar with one exterior triangle and a posterior trefoil; middle upper molar with one internal triangle; front lower molar with two internal and one external triangle; fore claws not larger than hinder; fur ordinary; size medium. (*Pedomys.*)

2. ***A. austerus,*** LeC. Tail one-third length of head and body, or less. Western States, E. to Michigan.

*** Teeth as in *Pedomys;* fore claws larger than hinder; fur dense, silky, mole-like; size small. (*Pitymys.*)

3. ***A. pinetorum,*** LeC. PINE MOUSE. Tail about one-fourth length of head and body. E. U. S.

7. ***SYNAPTOMYS,*** Baird. COOPER'S MOUSE.

1. ***S. cooperi,*** Baird. Head short and heavy; fur soft and long. W. States, E. to Ind.

8. ***FIBER,*** Cuvier. MUSKRATS.

1. ***F. zibethicus,*** (L.) Cuv. MUSKRAT. MUSQUASH. A well-known aquatic animal, the largest of our *Muridæ.* N. Am.; every where.

FAMILY XV.—SPALACOPODIDÆ.

(*The Porcupines.*)

Body more or less armed with spines. Molars rooted, $\frac{4\cdot4}{4\cdot4}$. Toes 4–5 in ours, sub-equal, with long, compressed, curved claws; soles warty. Muzzle hairy; upper lip without a groove; chiefly arboreal; nearly all are South American. The above characters apply rather to the sub-family *Cercolabinæ*, to which our genus belongs, than to the whole family.

1. ***ERETHIZON,*** F. Cuvier. American Porcupines.

1. ***E. dorsatus,*** (L.) F. Cuvier. White-haired Porcupine. Dark brown, spines chiefly white. N. Am., S. to Mexico.

FAMILY XVI.—LEPORIDÆ.

(*The Hares.*)

Incisors $\frac{4}{2}$, the extra pair in upper jaw small, and placed behind the principal pair, which are grooved in front; molars $\frac{6\cdot6}{5\cdot5}$. A single well-known genus, widely distributed.

1. ***LEPUS,*** Linnæus. Hares.

* Fur white in winter.

1. ***L. americanus,*** Erxleben. White Rabbit. Northern Hare. Size large; hind feet longer than head; ears about equal to length of head; fur, in summer, cinnamon brown, in winter, becoming white at the surface, plumbeous at base, with a broad median band of reddish brown. Wooded districts, New England to Minn., and S. to Va., along the Alleganies.

** Fur never white.

2. ***L. sylvaticus,*** Bachman. Gray Rabbit. Size small; hind feet not longer than head; ears two-thirds length of head; gray above, varied with black, and more or less tinged with yellowish brown; below white. U. S. eastward; less northerly than the preceding. Two Southern species, *L. palustris*, Bach., the Marsh Rabbit, and *L. aquaticus*, Bach., the Water Rabbit, abound in S. Ills. (*Nelson.*)

ORDER F.—MARSUPIALIA.

(*The Marsupials.*)

FAMILY XVII.—DIDELPHIDIDÆ.

(*The Opossums.*)

Marsupial mammals of small size, with the teeth i. $\frac{5\cdot5}{4\cdot4}$, c. $\frac{1\cdot1}{1\cdot1}$, pm. $\frac{3\cdot3}{3\cdot3}$, m. $\frac{4\cdot4}{4\cdot4}$. Feet five-toed, plantigrade, claws 5–4. Tail usually very long, nearly naked, covered by a scaly skin, with a few scattered hairs, prehensile. All the species are American.

1. **DIDELPHYS,** Linnæus. Opossums.

1. **D. virginiana,** Shaw. Common Opossum. Dirty white; legs dark; L. 35; T. 14. N. Y. to Rocky Mountains, rather southerly; common.

Class II. — Aves.

(*The Birds.*)

A Bird may be defined as an air-breathing vertebrate with a covering of feathers; warm blood; a complete double circulation; the two anterior limbs (wings) adapted for flying or swimming, the two posterior limbs (legs) adapted for walking or swimming; respiration never effected by gills or branchiæ, but, after leaving the egg, by lungs which are connected with air cavities in various parts of the body. Reproduction by eggs, which are fertilized within the body and hatched externally, either by incubation or exposure to the heat of the sun; the shell calcareous, hard and brittle.

Much more might be added, but the obvious distinction is this: — *All Birds have feathers, and no other animal has feathers.*

The classification of this group, as of most others, is still in an unsettled condition. Strictly speaking, the existing members of the class are so closely related that they might, with propriety, be combined into one order, which, by Prof. Gill, has been named EURHIPIDURA. At present, however, the term "order" may be applied to the groups so designated below, without thereby implying any such structural differences as exist between the "orders" of Reptiles or Fishes.

We now proceed to an artificial key to the

ORDERS OF BIRDS.

* Toes 3: two in front, one behind. . . . PICARIÆ, H.

** Toes 3: all in front; toes cleft or semipalmate. LIMICOLÆ, M.

*** Toes 4: two in front, two behind.

Bill cered and hooked. . . . PSITTACI, I.

Bill lengthened, not cered. . . PICARIÆ, H.

**** Toes 4: three in front, one behind.

I. Toes not webbed at all, cleft to the base, or with the basal joints immovably coherent.

a. Hind toe inserted on a level with the rest and generally longer than the shortest anterior toe.

b. Claw of hind toe at least as long as that of middle toe.

† Bill without cere, never very strongly hooked; outer toe not versatile. . . . . PASSERES, G.

†† Bill with cere, strongly hooked; outer toe usually versatile; claws very sharp and strong. RAPTORES, J.

bb. Claw of hind toe shorter than that of middle toe.

‡ Bill stoutish; nostrils opening beneath a soft, swollen membrane (shrunken in drying). COLUMBÆ, K.

‡‡ Bill tenuirostral, very slender; secondaries 6, very short. Humming-birds. . . PICARIÆ, H.

aa. Hind toe elevated above the level of the rest, and usually shorter than the others.

c. Bill fissirostral — culmen very short, but gape very wide and deep, reaching to below eyes. . PICARIÆ, H.

cc. Bill lengthened, not fissirostral.

d. First primary emarginate, or else about as long as second. . . . . . LIMICOLÆ, M.

dd. First primary not emarginate, shorter than second. ALECTORIDES, O.

II. Toes syndactyle — without webbing, but with the outer and middle toes coherent half their length. . PICARIÆ, H.

III. Toes semipalmate; two or three of them joined at base only by evident movable webbing.

e. Hind toe inserted on a level with the rest.

f. Tibiæ feathered below.

g. Bill cered and hooked; claws sharp and strong. RAPTORES, J.

gg. Bill not cered and hooked; nostrils opening beneath a soft, swollen membrane. . . COLUMBÆ, K.

ff. Tibiæ naked below. . . . Herodiones, N.

ee. Hind toe inserted above the level of the rest, and usually shorter than any of the others.

h. Tibiæ feathered below.

i. Nostrils perforate; head more or less naked. Raptores, J.

ii. Nostrils imperforate.

j. Bill fissirostral — gape wide, reaching to below eye. Picariæ, H.

jj. Bill stout, not fissirostral; nostrils scaled or feathered. Gallinæ, L.

hh. Tibiæ naked below.

k. Nostrils perforate. . . . Alectorides, O.

kk. Nostrils imperforate.

l. Head bald; tarsus reticulate. . Herodiones, N.

ll. Head feathered; tarsus usually scutellate. Limicolæ, M.

IV. Toes lobate, webbed at base or not, but *conspicuously* bordered on sides by plain or scalloped membranes.

m. Tail rudimentary; legs set far back. . Pygopodes, S.

mm. Tail short; a horny frontal shield. Alectorides, O.

mmm. Tail perfect; forehead feathered, without horny shield. Limicolæ, M.

V. Toes palmate; three front toes full-webbed.

n. Bill curved upwards; legs elongated. . Limicolæ, M.

nn. Bill lamellate, mostly flattish and furnished at tip with a decurved nail. . . . Lamellirostres, P.

nnn. Bill not recurved nor lamellate.

o. Hind toe not lobate; wings long and pointed; tail well developed. . . . . Longipennes, R.

oo. Hind toe lobate; wings and tail short. Pygopodes, S.

VI. Toes totipalmate; all four full-webbed. Steganopodes, Q.

G. FAMILIES OF PASSERES.

I. *Oscines.* Each side of tarsus covered with a plate, undivided in most of its length and meeting its fellow in a sharp ridge behind (in a few cases, back of tarsus without ridge, and formed of a few scutella distinct from those lapping over the front); first primary short, spurious or wanting, if present, not more than two-thirds of the longest; musical apparatus highly developed.

* First primary short or spurious; (primaries 10).

† Tarsus booted; rictus with bristles.

a. Middle toe quite free from inner; birds of moderate size, length more than 6.

b. Wings moderate, not reaching when folded beyond the middle of tail, and not more than one-third longer than tail; tip of wing formed by 3d to 6th quill; no blue. . . . . . . TURDIDÆ, 18.

bb. Wings very long, pointed, reaching beyond middle of tail, and more than half longer; tip of wing formed by 2d to 4th quills; ours chiefly blue. SAXICOLIDÆ, 19.

aa. Middle and inner toes connected at base; small, length less than 5. . . . . SYLVIIDÆ, 20.

†† Tarsus scutellate in front.

c. Nostrils concealed by tufts of antrorse, bristly feathers.

d. First primary not more than half length of second; bill not notched; length less than 8.

e. Bill as long as head; wings pointed, much longer than tail. . . . . SITTIDÆ, 22.

ee. Bill much shorter than head; wings about as long as tail. . . . . PARIDÆ, 21.

dd. First primary more than half length of second; bill usually notched, the bristly nasal feathers branched to their tips; large, length more than 8. CORVIDÆ, 35.

cc. Nostrils exposed (rarely slightly overhung).

f. Bill distinctly notched near its tip, often hooked.

g. Tail longer than wings; general color gray or ashy-brown.

h. Bill very stout, compressed, strongly notched, toothed and abruptly hooked at tip; large, length 8 to 9. LANIIDÆ, 32.

hh. Bill more slender, not deeply notched nor abruptly hooked; length 8 to 10. . . TURDIDÆ, 18.

hhh. Bill very slender, not strongly notched nor hooked; small, length 4 to 5. . . SYLVIIDÆ, 20.

gg. Tail shorter than wings; general color olivaceous; bill stout, notched and hooked; length 4½ to 6½. VIREONIDÆ, 31.

ff. Bill not at all notched.

i. Rictus with bristles; quills not barred, the tail longer than wings; large, length 9 or more. TURDIDÆ, 18.

ii. No rictal bristles; wings and tail barred or undulated, usually about equal in length, the latter of rounded feathers; small, length 6 or less. TROGLODYTIDÆ, 24.

iii. No rictal bristles; tail about as long as wings, scansorial,—its feathers rigid and acute, not barred; bill long, decurved; length 5 to 6. . CERTHIIDÆ, 23.

** First primary about as long as second; (the real first one being minute and misplaced, leaving only 9 evident).

‡ Bill fissirostral,—triangular, depressed, about as wide at base as long; its wide, deep gape twice as long as the culmen, reaching to opposite the eyes; no rictal bristles; wings very long and pointed. . . . HIRUNDINIDÆ, 29.

‡‡ Bill tanagrine,—stout, conic, its outlines convex, the tomia with one or more lobes or nicks near the middle; nostrils very high; plumage brilliant, chiefly red (♂) or yellow (♀). TANAGRIDÆ, 28.

‡‡‡ Bill conirostral,—stout at base, and more or less conic; nostrils high up; tomia more or less evidently *angulated* near the base (*i. e.*, "corners of mouth drawn downward.")

j. Bill truly conic, much shorter than the head, usually notched at tip, or with bristles at the rictus. FRINGILLIDÆ, 33.

jj. Bill conic, but lengthened more or less, about as long as head (except in *Dolichonyx* and *Molothrus*, the Bob-o-link and Cowbird); no notch at the tip or bristles at the rictus. . . . . ICTERIDÆ, 34.

‡‡‡‡ Bill not as above, with the tomia straight, or very gently curved.

k. Conspicuously crested; bill triangular, depressed, notched, and hooked; tail tipped with yellow; secondaries (in full plumage) with red, horny tips. . AMPELIDÆ, 30.

kk. Nostrils concealed by bristly feathers; tarsus scutellate behind; hind claw long and nearly straight; inner secondaries lengthened. . . . ALAUDIDÆ, 25.

kkk. No crest; nostrils exposed; tarsus strictly "oscine."

l. Hind claw much elongated, twice as long as middle claw, with its toe much longer than middle toe and claw; bill very slender; longest secondary nearly equal to primaries in closed wing. . MOTACILLIDÆ, 26.

ll. Hind claw not specially elongated, not twice as long as middle claw; inner secondaries not lengthened.

m. Bill stout, compressed, notched, and abruptly hooked at tip; general color olivaceous, tail not blotched with white or yellow. . . VIREONIDÆ, 31.

mm. Bill various, notched or not, but little, if at all, hooked; colors often brilliant. SYLVICOLIDÆ, 27.

II. *Clamatores.* Outside of tarsus covered with a series of plates variously arranged, lapping entirely around in front and behind to meet in a groove on the inner side; primaries 10.

n. First primary lengthened, often longest, always more than $\frac{2}{3}$ length of the longest; bill broad, depressed, tapering to a point which is abruptly hooked; rictal bristles numerous; nostrils overhung but not concealed; tail not tipped with yellow. . . . . TYRANNIDÆ, 36.

H. FAMILIES OF PICARIÆ.

I. Feet zygodactyle (two toes in front, two behind) by reversion of outer toe; (hallux wanting in *Picoides.*)

a. Tail scansorial, of 12 rigid, acuminate feathers, of which the outer pair are short and concealed; bill stout and straight; nasal tufts usually developed. . . . PICIDÆ, 42.

aa. Tail not scansorial, of 8 to 10 long, soft feathers; bill decurved; no nasal tufts. . . . . CUCULIDÆ, 41.

II. Feet syndactyle, by cohesion of outer and middle toes; tibiæ naked below; bill stout and straight, longer than head. ALCEDINIDÆ, 40.

III. Feet neither zygodactyle nor syndactyle; wings long and pointed.

b. Bill tenuirostral, very slender, much longer than head; secondaries very short, 6 in number: plumage compact.
TROCHILIDÆ, 39.

bb. Bill fissirostral, much shorter than head; secondaries more than 6.

c. Rictal bristles present; middle claw pectinate; plumage lax, variegated; length 8 or more. CAPRIMULGIDÆ, 37.

cc. No rictal bristles; plumage compact, of blended colors; tail feathers (in ours) spinous; length 6 or less.
CYPSELIDÆ, 38.

I. FAMILIES OF PSITTACI.

I. Cere feathered, concealing the nostrils; plumage coarse and dry, chiefly green. . . . . . . ARIDÆ, 43.

J. FAMILIES OF RAPTORES.

I. Hind toe on a level with the rest, more than half length of outer toe, and with a large claw; claws strong, sharp, much curved; nostrils imperforate; head mostly feathered; bill strongly hooked.

a. Eyes directed forwards in consequence of the great lateral expansion of the cranium, and surrounded by a disk of radiating bristly feathers. . . . STRIGIDÆ, 44.

aa. Eyes lateral; no complete facial disk. . FALCONIDÆ, 45.

II. Hind toe elevated, not more than half length of outer toe; claws weak and little curved; nostrils perforate; head mostly naked; bill little hooked. . . . CATHARTIDÆ, 46.

K. FAMILIES OF COLUMBÆ.

I. Head small, feathered (except sometimes a circumorbital ring); feathers loosely inserted. . . . COLUMBIDÆ, 47.

L. FAMILIES OF GALLINÆ.

I. Head unfeathered, with wattles and caruncles; a tuft of bristly feathers on breast; tarsus spurred in ♂; plumage iridescent; large, 36 or more. . . . . . MELEAGRIDÆ, 48.

II. Head feathered; plumage not iridescent; size much smaller.

Tarsus partly or entirely feathered, as is also the nasal groove; sides of neck usually with bare skin or peculiar feathers. . . . . . TETRAONIDÆ, 49.

Tarsus and nasal groove unfeathered; no peculiar feathers on neck. . . . . . . PERDICIDÆ, 50.

M. FAMILIES OF LIMICOLÆ.

I. Toes lobate; tarsus notably compressed; body depressed. PHALAROPODIDÆ, 54.

II. Toes not lobate; tarsus not specially compressed.

* Legs exceedingly long; tarsus as long as tail; bill much longer than head, slender, acute, and curved upwards; feet 4-toed and palmate, or 3-toed and semipalmate. RECURVIROSTRIDÆ, 53.

** Bill usually shorter than head, pigeon-like, the broad, soft base separated by a constriction from the hard tip; head sub-globose, on a short neck; tarsus reticulate; toes 3 (except in *Squatarola*). . . . CHARADRIIDÆ, 51.

*** Bill usually longer than head, mostly grooved, not constricted, softish to its tip; tarsus scutellate; toes 4 (except in *Calidris*). . . . . . SCOLOPACIDÆ, 55.

**** Not as above; bill hard, either compressed and truncate, or acute; feet 4-toed and cleft, or 3-toed and semipalmate. HÆMATOPODIDÆ, 52.

N. FAMILIES OF HERODIONES.

I. Bill long, straight, acute; middle claw pectinate. ARDEIDÆ, 56.

II. Bill curved downwards, or else flat and spoon-shaped. TANTALIDÆ, 57.

O. FAMILIES OF ALECTORIDES.

I. Very large; length 36 or more, with excessively long neck and legs; toes shorter than tarsus; bill contracted at the middle. GRUIDÆ, 58.

II. Smaller, length 18 or less, with comparatively short neck and legs; toes as long as tarsus; bill not contracted. RALLIDÆ, 59.

P. FAMILIES OF LAMELLIROSTRES.

I. Legs not very long; tibiæ feathered; bill not decurved.
ANATIDÆ, 60.

Q. FAMILIES OF STEGANOPODES.

I. Bill longer than tail, many times longer than head, with the gular pouch enormous; wings long. . PELECANIDÆ, 61.

II. Bill about as long as head, shorter than tail, which is fan-shaped, of rigid feathers; wings short.
PHALACROCORACIDÆ, 62.

R. FAMILIES OF LONGIPENNES.

I. Nostrils not tubular, perforate; bill with a continuous covering.
LARIDÆ, 63.

S. FAMILIES OF PYGOPODES.

I. Feet palmate; tail developed; head closely feathered.
EUDYTIDÆ, 64.

II. Feet lobate; tail undeveloped; head usually with naked loral strip and peculiar feathers. . . . PODICIPIDÆ, 65.

ORDER G.—PASSERES.

(*Passerine Birds.*)

Toes always 4; feet fitted for perching; the hind toe always on a level with the rest, its claw at least as long as that of middle toe, and often much longer; joints of toes respectively 2, 3, 4, 5, from first to fourth; toes never versatile; wing coverts comparatively few, chiefly in two series. Tail feathers 12, primaries 9 or 10. Musical apparatus more or less developed. Sternum of a certain uniform pattern. Nature altricial.

This group comprises the great majority of all Birds, and they represent the "highest grade of development, and the most complex organization of the class; their high physical irritability is co-ordinate with the rapidity of their respiration and circulation; they consume the most oxygen and live the fastest of all birds." (*Coues.*)

FAMILY XVIII.—TURDIDÆ.

(*The Thrushes.*)

Primaries 10, the first short or spurious; bill generally rather long, not conical, usually with a slight notch near the tip; nostrils oval, not concealed, but nearly or quite reached by the bristly frontal feathers; rictus with bristles, which are well developed in most of our species; tarsus in typical species, "booted," *i. e.*, enveloped in a continuous plate, formed by the fusion of all the scutellæ except two or three of the lowest; in other species distinctly scutellate. Toes deeply cleft, the inner one free, the outer united to the middle one, not more than half the length of the first basal joint.

A large family of more than two hundred species, found in most parts of the world, and embracing quite a wide variety of forms. Nearly all of them are remarkable for their vocal powers. Their food consists of insects and soft fruits.

Our species fall into three strongly marked sub-families, of which the *Miminæ* have been often associated with the Wrens, and the *Myiadestinæ* with the Wax Wings.

I. The TURDINÆ, or Typical Thrushes, have the tarsus booted, the first primary spurious, and the wings longer than the tail. They build rather rude nests, sometimes plastered with mud, and they lay four to six greenish or bluish eggs, either plain or speckled. All sing well, and some of them most exquisitely. Our species are usually referred to the typical genus, *Turdus*, but we have here separated the Wood Thrushes, as a group of full generic value (*Hylocichla*), as suggested by Prof. Baird. (Hist. N. Am. Birds, page 4.)

II. The Miminæ, or Mocking Thrushes, have the tarsus scutellate (sometimes booted in *Galeoscoptes*), the first primary scarcely spurious; the rictal bristles better developed, and the tail relatively longer, in our species longer than the wings. These birds have a brilliant and varied song, but all of them are plainly clad. All are American.

III. Myiadestinæ, the Fly-Catching Thrushes, have been usually associated with the *Ampelidæ*, but their affinities are rather with the thrushes, as Prof. Baird has shown. All are American,—the single species within our limits is a rare straggler from the West.

* Tarsus booted; wings longer than tail. (Turdinæ.)

† Breast spotted; length 8½, or less. . . Hylocichla, 1.

†† Breast unspotted; (in ours) reddish or banded with black; length 9½, or more. . . . . . Turdus, 2.

** Tarsus scutellate in front (scutella rarely obsolete); wings (in ours) shorter than tail. (Miminæ.)

‡ Bill about as long as head, sometimes much longer, straight or curved, not notched. . . Methriopterus, 3.

‡‡ Bill much shorter than head, notched at tip.

a. Tarsus distinctly scutellate; ours ashy, with black and white. . . . . Mimus, 4.

aa. Tarsus feebly scutellate; plumage lead-colored; crissum chestnut-red. . . . . . Galeoscoptes, 5.

*** Tarsus booted; wings about equal to tail; bill short, much depressed, notched and hooked; color ashy. (Myiadestinæ.) Myiadestes, 6.

1. *HYLOCICHLA,* Baird. Wood Thrushes.

< *Turdus*, Linn.

1. ***H. mustelina,*** (Gm.) Bd. Wood Thrush. Cinnamon brown, brightest on the head, shading into olive on the

rump; breast with large, very distinct dusky spots; L. 8; W. $4\frac{1}{4}$; T. 3. E. U. S., in woodland; our largest and handsomest thrush. An exquisite songster.

2. ***H. unalascœ,*** (Gmel.) Hermit Thrush. Olive brown above, becoming rufous on rump and tail; breast with numerous, rather distinct, dusky spots; a whitish orbital ring; L. 7; W. $3\frac{1}{2}$; T. $2\frac{1}{2}$. N. Am., migrating early.

3. ***H. ustulata*** (Nutt.) Bd. Olive-backed Thrush. Swainson's Thrush. Uniform olive above; breast and throat thickly marked with large, dusky olive spots; breast and sides of head strongly buffy-tinted; a conspicuous buffy orbital ring; L. $7\frac{1}{4}$; W. 4; T. 3. N. Am.

4. ***H. aliciœ,*** Baird. Gray Cheeked Thrush. Alice Thrush. Similar to the preceding, of which it is probably a variety, but without ring about eye, or any buffy tint about head. E. N. Am., ranging more northerly.

5. ***H. fuscescens,*** (Steph.) Bd. Tawny Thrush. Wilson's Thrush. Veery. Uniform tawny above; breast and throat washed with brownish or pinkish yellow, and marked with small indistinct brownish spots; L. $7\frac{1}{2}$; W. $4\frac{1}{4}$; T. $3\frac{1}{5}$. E. N. Am., frequent, a fine songster.

2. ***TURDUS,*** Linnæus. Thrushes.

* Sexes similar; breast not spotted nor banded; throat streaked; bill notched. (*Merula.*)

1. ***T. migratorius,*** L. Robin. American Red Breast. Olive gray above; head and tail blackish; throat white, with black streaks; under parts chestnut brown; L. $9\frac{3}{4}$; W. $5\frac{1}{2}$; T. $4\frac{1}{2}$. N. Am., abundant.

** Sexes unlike; throat unstreaked; male with a black collar; bill not notched. (*Hesperocichla*, Bd.)

2. ***T. nœvius,*** Gm. OREGON ROBIN. VARIED THRUSH. Slate color, orange brown below; L. 9¾; W. 5; T. 4. Pacific slope, accidental in Mass., N. J., and L. I.

3. *METHRIOPTERUS,* Reich. MOCKING THRUSHES.

1. ***M. rufus,*** (L.) Ridgw. BROWN THRUSH. SANDY MOCKING BIRD. THRASHER. Cinnamon red above; lower parts thickly spotted; bill nearly straight, shorter and much less curved than in many other *Harporhynchi*, five species of which occur in the U. S. beyond the Rocky Mountains; L. 11; W. 4; T. 5¼. E. U. S., abundant. A brilliant songster.

4. *MIMUS,* Boie. MOCKING BIRDS.

1. ***M. polyglottus,*** (L.) Boie. MOCKING BIRD. Ashy brown above; wings blackish, with white wing bars; tail blackish, outer feathers white; L. 9½; W. 4½; T. 5. U. S., chiefly southerly; N. to Mass., Iowa, etc. A renowned songster.

5. *GALEOSCOPTES,* Cabanis. CAT BIRDS.

< *Mimus*, Boie.

1. ***G. carolinensis,*** (L.) Cab. CAT BIRD. Dark slate color; crown and tail black; crissum brownish chestnut; L. 8¾; W. 3¾; T. 4. U. S., every where.

6. *MYIADESTES,* Swainson. FLY-CATCHING THRUSHES.

1. ***M. townsendi,*** (Aud.) Cab. TOWNSEND'S SOLITAIRE. Ashy gray, paler below; wing bands buffy; tail blackish; whitish ring about eye; young with reddish spots; L. 8; W. 4½; T. 4½. Rocky Mountains and westward, straying E. to Chicago. (*Nelson.*) An exquisite songster.

FAMILY XIX.—SAXICOLIDÆ.

(*The Stone Chats.*)

Characters similar to those of the Thrushes, but the wings longer and very much pointed, reaching, when folded, beyond the middle of the short tail. Tarsus "booted;" first primary spurious. A family scarcely distinct from *Turdidæ*, of about twelve genera and one hundred species. They are chiefly Old World birds, but two genera occurring in America. Ours are rather small (less than seven), with oval nostrils and bristles about the rictus.

* Chiefly or partly blue; tarsus not longer than middle toe and claw; bill stout. . . . . Sialia, 1.

1. *SIALIA*, Swainson. Blue Birds.

1. ***S. sialis***, (L.) Haldeman. Common Blue Bird. Bright blue above, throat and breast reddish brown, belly white; ♀ usually duller with a brownish tinge on back; young, as in others, spotted; L. 6¾; W. 4; T. 3. E. N. Am., abundant; breeds every where.

2. ***S. mexicana***, Sw. Western Blue Bird. Head, neck all around and upper parts generally, blue; back with more or less chestnut; breast and sides reddish brown, otherwise bluish below; size of last. Pacific Slope, E. to Iowa (accidental.)

3. ***S. arctica***, Sw. Rocky Mountain Blue Bird. Rich greenish blue; belly white; ♀ with pale drab, instead of blue, on breast, etc.; size of others, or smaller. Central Table lands chiefly, E. to Missouri R.

FAMILY XX.—SYLVIIDÆ.

(*The Sylvias.*)

Primaries 10, the first short but scarcely spurious. Bill slender, depressed at base, notched and decurved at tip. Rictal bristles conspicuous; nostrils oval, overhung by a few bristles or a feather. Tarsus booted or scutellate. Basal joint of middle toe attached its whole length externally, half way internally. A large family of nearly six hundred species of small birds, chiefly of the Old World, where they take the place filled in America by the *Sylvicolidæ*. To this family belongs the European nightingale. Our species fall into two sub-families, *Regulinæ* and *Polioptilinæ*, each represented by its typical genus.

* Tarsus booted; wings longer than tail. . . REGULUS, 1.

** Tarsus scutellate; wings not longer than tail. POLIOPTILA, 2.

1. *REGULUS,* Cuvier. KINGLETS.

1. ***R. satrapa,*** Licht. GOLDEN-CROWNED KINGLET. Olivaceous; crown with a yellow patch, bordered with black, orange red in the center in ♂; extreme forehead and line over eye, whitish; vague dusky blotch at base of secondaries; a tiny feather over each nostril; L. 4; W. $2\frac{1}{4}$; T. $1\frac{3}{4}$. N. Am.

2. ***R. calendula,*** (L.) Licht. RUBY-CROWNED KINGLET. Olivaceous; crown with a scarlet patch in both sexes, wanting the first year; no black about head; no nasal feather; L. $4\frac{1}{4}$; W. $2\frac{1}{3}$; T. $1\frac{3}{4}$. N. Am.

2. *POLIOPTILA,* Sclater. GNAT CATCHERS.

1. ***P. cœrulea,*** (L.) Sclater. BLUE-GRAY GNAT CATCHER. Clear ashy blue, brightest on head; whitish below; ♂ with forehead and sides of crown black; outer tail feathers chiefly white; L. $4\frac{1}{3}$; W. 2; T. $2\frac{1}{4}$. U. S., chiefly southerly; N. to Mass. and L. Mich. Noticeable for its sprightly ways and squeaky voice, "like a mouse with the toothache;" but really a fine singer.

FAMILY XXI.—PARIDÆ.

(*The Titmice.*)

Primaries 10, first short; wings rounded; not longer than the rounded tail. Bill much shorter than head, not notched nor decurved at the tip; loral feathers bristly, and nostrils concealed by dense tufts. Tarsus scutellate, longer than middle toe and claw. Toes much soldered at base, widened beneath into a sort of palm. Plumage lax, little variable.

Small birds, less than seven inches long, resembling the Jays in several respects, restless, noisy, and scarcely migratory. Species seventy-five or more, chiefly of the Northern hemisphere, and abounding in both continents.

* Conspicuously crested; chiefly lead gray, paler below. LOPHOPHANES, 1.

** Not crested; crown, chin and throat black or brown. PARUS, 2.

1. **LOPHOPHANES,** Kaup. TUFTED TITMICE.

1. **L. bicolor,** (L.) Bon. TUFTED TITMOUSE. Forehead alone black; whitish below; sides washed with reddish; L. 6¼; W. 3¼; T. 3¼. E. U. S., southerly; N. to L. I. and L. Mich.; abundant in woodland and remarkable for its loud, ringing notes. Three other species occur in the S. W.

2. **PARUS,** Linnæus. CHICKADEES.

1. **P. atricapillus,** L. TITMOUSE. BLACK-CAPPED CHICKADEE. Grayish ash; wings and tail plain with whitish edging; crown, nape, chin and throat black; no white superciliary line; L. 5; W. 2½; T. 2½. N. Am.; abundant.

Var. **carolinensis,** (Aud.) Coues. SOUTHERN CHICKADEE. Smaller; tail feathers not noticeably white-edged. E. U. S.; southerly.

2. ***P. hudsonicus,*** Forster. Hudsonian Chickadee. Olive brown; crown browner; some pale chestnut below; no white superciliary line; L. 5; W. $2\frac{1}{3}$; T. $2\frac{2}{3}$. British America; S. to Mass.

FAMILY XXII.—SITTIDÆ.

(The Nuthatches.)

Primaries 10, the first spurious. Wings long and pointed, much longer than the broad soft tail. Bill not notched, rather slender, straight, nearly as long as head. Loral feathers bristly; nostrils concealed by dense tufts. Tarsus scutellate, shorter than middle toe and claw. Tongue acute, barbed. Body depressed; plumage lax, but less so than that of the Titmice. Active, nimble little birds, running up and down trees, and hanging in every conceivable attitude, the head down as often as up. Species twenty-five or thirty, in most parts of the world.

1. SITTA, Linnæus. Nuthatches.

1. ***S. carolinensis,*** Gm. White-Bellied Nuthatch. "Sap Sucker." Ashy blue above, white below; crissum, etc., washed with rusty brown; crown and nape black, unstriped; middle tail feathers like the back, others black, blotched with white; ♀ with less or no black on the head; L. $5\frac{1}{2}$; W. $3\frac{1}{2}$; T. 2. U. S.; abundant every where.

2. ***S. canadensis,*** L. Red-Bellied Nuthatch. Ashy blue, brighter than the preceding, rusty brown below; crown glossy black (♂), or bluish (♀), bordered by white and black stripes; L. $4\frac{1}{2}$; W. $2\frac{2}{3}$; T. $1\frac{1}{2}$. U. S., and northward.

3. ***S. pusilla,*** Lath. Brown-Headed Nuthatch. Ashy blue; crown clear brown, a whitish spot on nape,

pale rusty below. L. 4; W. $2\frac{1}{2}$; T. $1\frac{1}{2}$. South Atlantic States.

FAMILY XXIII.—CERTHIIDÆ.

(*Creepers.*)

Primaries 10, first less than half second. Bill slender, as long as head; without notch or bristles, decurved. Tarsus scutellate, shorter than middle toe. Claws all very long, curved and compressed. Wings about as long as tail; tail feathers pointed, with stiffened shafts, almost wood-pecker like, and used for support in the same way. A small family of a dozen species, widely distributed. Habits similar to those of the Nuthatches, but the voice different, being small and fine. (The above diagnosis does not strictly apply to some foreign birds usually placed in this family.)

1. ***CERTHIA,*** Linnæus. BROWN CREEPERS.

1. ***C. familiaris,*** Linn. BROWN CREEPER. Plumage dark brown, much barred and streaked; rump clear tawny; L. $5\frac{1}{2}$; W. $2\frac{3}{4}$; T. $2\frac{3}{4}$. N. Am. and Europe. A curious little bird, recognizable at once by the scansorial tail.

FAMILY XXIV.—TROGLODYTIDÆ.

(*The Wrens.*)

Primaries 10, the first short but hardly spurious. Wings rounded, usually about as long as the graduated tail. Bill more or less slender, usually elongated, not notched in any of our species. Nostrils oval, unbristled, overhung by a scale-like membrane. No rictal bristles. Loral feathers bristly. Tarsus scutellate. Lateral toes nearly equal; middle toe usually united to half the basal joint of inner toe, and to the whole of the basal joint of the outer, or more. Quills barred in most of our species.

A large family of small birds, chiefly belonging to Tropical America. Genera about sixteen; species one hundred or more. "Our species are sprightly, fearless and impudent little creatures, apt to show bad temper when they fancy themselves aggrieved by cats or people, or any thing else that is big or unpleasant to them; they quarrel a good deal, and are particularly spiteful towards martins and swallows, whose homes they often invade and occupy. Their song is bright and hearty, and they are fond of their own music; when disturbed at it they make a great ado with noisy scolding. Part of them (*Cistothorus*) live in reedy swamps and marshes, where they hang astonishingly big globular nests, with a little hole on one side, on tufts of rushes, and lay six or eight dark colored eggs; the others nest any where." (*Dr. Coues.*) They are all plainly colored, being chiefly brown. All are insectivorous, and most of them migratory.

* Back nearly uniform in color a conspicuous white superciliary line; THRYOTHORUS, 1.

** Back barred crosswise, sometimes obscurely so; no conspicuous superciliary line; bill shorter than head; hind claw shorter than toe.

† Tail about as long as wings. . . . TROGLODYTES, 2.

†† Tail much shorter than wings. . . ANORTHURA, 3.

*** Back streaked lengthwise, at least on shoulders; hind claw as long as the toe; tail barred. . . . CISTOTHORUS, 4.

1. ***THRYOTHORUS,*** Vieillot. MOCKING WRENS.

* Tail not longer than wings, its feathers reddish brown with fine black bars. (*Thryothorus.*)

1. ***T. ludovicianus,*** (Gm.) Bon. CAROLINA WREN. Clear reddish brown, brightest on rump; tawny below;

L. 6; W. $2\frac{1}{2}$; T. $2\frac{1}{3}$. E. U. S., southerly; N. to Penn.; not migratory. A remarkable singer.

** Tail longer than wings, its feathers mostly black. (*Thryomanes.*)

2. ***T. bewickii,*** (Aud.) Bon. Bewick's Wren. Grayish brown; two middle tail feathers barred; L. $5\frac{1}{2}$; W. $2\frac{1}{4}$; T. $2\frac{1}{2}$. U. S., southerly; N. to Penn.

2. ***TROGLODYTES,*** Vieillot. Wrens.

1. ***T. aedon,*** Vieill. House Wren. Brown, brightest behind; rusty below; every where more or less waved with darker, distinctly so on wings, tail, etc.; L. 5; W. 2; T. 2. E. U. S.; abundant every where; very variable. *T. domesticus*, (Bart.) Coues.

3. ***ANORTHURA,*** Rennie. Winter Wrens.

1. ***A. troglodytes,*** (L.) Coues. Winter Wren. Deep brown, waved with dusky; belly, wings and tail strongly barred; L. 4; W. $1\frac{2}{3}$; T. $1\frac{1}{4}$. N. Am., northerly; U. S., in winter, not common. (*T. hyemalis*, Vieill.)

4. ***CISTOTHORUS,*** Cabanis. Marsh Wrens.

* Bill about half as long as head; no white superciliary line. (*Cistothorus.*)

1. ***C. stellaris,*** (Licht.) Cab. Short-Billed Marsh Wren. Dark brown, head and back darker; entire upper parts with white streaks; L. $4\frac{1}{2}$; W. $1\frac{3}{4}$; T. $1\frac{3}{4}$. E. U. S., in marshes; rather rare.

** Bill slender, about as long as head; a conspicuous white superciliary line. (*Telmatodytes*, Cab.)

2. ***C. palustris,*** (Wilson) Baird. Long-Billed Marsh Wren. Clear brown; back with a black patch containing white streaks; otherwise unstreaked above; crown blackish; rump brown; L. 5; W. 2; T. $1\frac{3}{4}$. U. S.; abundant in reedy swamps.

FAMILY XXV.—ALAUDIDÆ.

(*The Larks.*)

First primary very short or entirely wanting. Tarsus scutellate in front and behind (a character singular among *Oscines.*) Bill short, of various forms in different species; nostrils concealed by tufts of antrorse feathers. Hind claw very long and nearly straight. Inner secondaries lengthened and flowing. A group of about one hundred species, chiefly Old World birds, but a single genus belonging to America; many of them are renowned as vocalists.

* Primaries 9; a little tuft of lengthened black feathers over each ear (sometimes obscure in ♀.) . . . OTOCORIS, 1.

1. OTOCORIS, Bon. HORNED LARKS.

= *Eremophila*, Boie (preoccupied.)

1. ***O. alpestris***, (Forst.) Bon. SHORE LARK. Pinkish brown, thickly streaked; a crescent on breast and strip under eye black; white below; chin, throat, and line over eye more or less yellow; ♀ with less black; winter birds grayish, with the markings more obscure; L. 7¼; W. 4½; T. 3. N. Am. and Europe; common. A pleasant singer. [*E. cornuta*, (Wilson) Boie.]

FAMILY XXVI.—MOTACILLIDÆ.

(*The Wagtails.*)

Primaries 9, first about as long as second; inner secondaries enlarged, the longest one about as long as the primaries in the closed wing. Bill shorter than the head, very slender, straight, acute, notched at tip. Feet large, fitted for walking; hind claw long and nearly straight, inner toe cleft; basal joint of outer toe united with middle one. Rictal bristles not conspicuous; nostrils exposed.

A group of about one hundred species, mostly of the Old World, connecting the *Alaudidæ* with the *Sylvicolidæ.* Most of them are terrestrial. They have a habit (shared by various others) of moving the tail up and down, as if "balancing themselves on unsteady footing;" hence the name "Wagtail."

* Tarsus longer than middle toe and claw; outstretched feet falling much short of end of tail. . . . ANTHUS, 1.

1. ANTHUS, Bechstein. TITLARKS.

1. ***A. pennsylvanicus,*** (Lath.) BROWN LARK. TITLARK. PIPIT. Dark brown, slightly streaked; superciliary line and under parts buffy; breast and sides streaked; outer tail feathers more or less white; L. 6½; W. 3½; T. 3. N. Am.; generally abundant. (The Missouri Skylark, *Neocorys spraguei*, is a near relative.)

FAMILY XXVII. — SYLVICOLIDÆ

(*The Warblers.*)

Primaries 9; inner secondaries not enlarged, nor the hind toe long and straight, as in *Alaudidæ* and *Motacillidæ.* Bill usually rather slender, notched or not; the commissure not angulated at base, as in *Fringillidæ*, nor toothed in the middle, as in our *Tanagridæ;* the end not notched and abruptly hooked, as in *Vireonidæ* and *Laniidæ;* the gape not broad and reaching to the eyes, as in *Hirundinidæ.*

Our warblers are small birds; all (except *Icteria* which may not belong here) are less than six and a half inches in length, and very many are less than five. The rictus is generally bristled, but in several of our genera it is not. The colors are usually brilliant and variegated, but the sexes are unlike, and the variations due to age and season are great, so that the study of the species is often very difficult. Many of the Warblers are pleasing songsters, but none exhibit any remarkable powers in that line. All are insectivorous and migratory.

This family consists of more than a hundred species, chiefly North American, and embraces quite a wide variety, so that the group can perhaps be only distinguished negatively. The *Sylvicolidæ* grade perfectly into the *Tanagridæ* and *Cœrebidæ*, and probably the three families, and perhaps the *Fringillidæ*, also, should be merged into one. Our species are divisible into three very distinct sub-families, indicated below.

I. Bill slender, not hooked, as high as wide at base, with short bristles not reaching much beyond nostrils, or none; wings longer than tail (except *Geothlypis*); length 6½ or less. True Warblers. (SYLVICOLINÆ.)

* Tail feathers, some or all of them blotched with white.

† Rictus with evident bristles.

‡ Tarsus shorter than middle toe and claw; entirely black and white, streaked. . . . MNIOTILTA, 1.

‡‡ Tarsus not shorter than middle toe and claw.

a. Hind toe decidedly longer than its claw; bill acute, scarcely notched; bluish, throat and middle of back with yellow. . . . . COMPSOTHLYPIS, 2.

aa. Bill very acute, notched, perceptibly decurved, so that the gonys is slightly concave; rump and under parts chiefly yellow. . . PERISSOGLOSSA, 6.

aaa. Warblers without above characters. DENDRŒCA, 7.

†† Rictus without evident bristles.

b. Whole head and neck bright yellow; bill notched, half inch or more long. . . . PROTONOTARIA, 3.

bb. Whole head and neck not yellow; bill acute, not notched nor bristled, less than half inch long. HELMINTHOPHILA, 5.

** Tail feathers yellow on inner webs; outer webs dusky; plumage chiefly yellow. . . . DENDRŒCA, 7.

*** Tail feathers all unmarked; same color on both webs.

c. Conspicuously streaked below; head plain or with two black stripes; legs long. . . . . SIURUS, 8.

cc. Not streaked below.

d. Wings about as long as tail; chiefly yellow below; crown (of ♂) black or ashy; legs strong. GEOTHLYPIS, 10.

dd. Wings decidedly longer than tail.

e. Bill not notched, half inch or more long; head plain or with four black stripes. . HELMITHERUS, 4.

ee. Bill less than half an inch long.

f. Bill notched; wings more than 2½; crown plain or with black. . . . . OPORORNIS, 9.

ff. Bill not notched, nor bristled, very acute; wings less than 2½; crown plain or with a bright spot. HELMINTHOPHILA, 5.

II. Bill rather stout, not notched, hooked nor bristled; tail longer than wings; length 7 to 8. Chats. (ICTERINÆ.) ICTERIA, 11.

III. Bill depressed, broader at base than high, notched and somewhat hooked, with strong rictal bristles half the length of bill; wings longer than tail; length 5½ or less. Fly-catching Warblers. (SETOPHAGINÆ.)

a. Bill fully twice as long as wide at base; tail feathers unmarked, or blotched with white. . MYIODIOCTES, 12.

aa. Bill scarcely twice as long as wide at base; tail marked with orange or yellow. . . . SETOPHAGA, 13.

1. ***MNIOTILTA,*** Vieillot. CREEPING WARBLERS.

1. ***M. varia,*** (L.) Vieill. BLACK AND WHITE CREEPER. Entirely black and white, streaked; crown with a broad white stripe; white wing bars; ♀ grayer; L. 5; W. 2¾; T. 2¼. E. U. S.; a neat bird, with some of the habits of a Nuthatch.

2. *CHLORIS,* Boie. Blue Yellow-Backed Warblers.

=*Parula*, Bonaparte.

= *Sylvicola*, Sw. (Preoccupied in Mollusks.)

1. ***C. americana,*** (L.) Jor. Blue Yellow-Backed Warbler. Clear ashy blue; back with a large golden-green patch; yellow below, belly white; a brown band across breast; white wing bars. ♀ obscurely marked; L. 4¾; W. 2⅓; T. 2. Miss. Valley and E. One of our most elegant species, inhabiting tree-tops.

3. *PROTONOTARIA,* Baird. Golden Swamp Warblers.

1. ***P. citræa,*** (Bodd.) Bd. Prothonotary Warbler. Golden-Headed Warbler. Front and lower parts brilliant yellow; back, wings, etc., olivaceous; bill long; L. 5½; W. 3; T. 2¼. U. S., southward; N. to Wabash Valley, in bushy swamps, rather rare, one of the most beautiful of our birds.

4. *HELMITHERUS,* Rafinesque. Swamp Warblers.

1. ***H. vermivorus,*** (Gm.) Bon. Worm-Eating Swamp Warbler. Olive gree head yellowish, with four black stripes; buffy below; ♀ similar; L. 5½; W. 3; T. 2⅓. E. U. S.; N. to L. Erie.

5. *HELMINTHOPHILA,* Ridgw. Worm-Eating Warblers. (See Addenda.)

* Tail feathers conspicuously blotched with white.

1. ***H. chrysoptera,*** (L.) Blue Golden-Winged Warbler. Ashy blue; forehead, crown and wing bars bright yellow; throat and broad stripe through eye, black, white below; ♀ duller; L. 5; W. 2½; T. 2¼. S. E. States, rather rare; N. to Green Bay; a beautiful species.

2. ***H. pinus,*** (L.) Blue-Winged Yellow Warb-

ler. Olive yellow; crown and all under parts bright yellow; wing bars whitish; loral strip black; ♀ similar; L. 4½; W. 2⅓; T. 2. S. E. States; N. to N. Y. A handsome bird, like a miniature *Protonotaria*.

** Tail feathers without white blotches.

3. ***H. ruficapilla***, (Wils.) Nashville Warbler. Olive green, ashy on head and neck; crown patch bright chestnut, more or less concealed; bright yellow below; lores and orbital ring pale; ♀ duller, crown patch obscure; L. 4⅔; W. 2½; T. 2. E. U. S., frequent.

4. ***H. celata,*** (Say) Orange-Crowned Warbler. Olive green, never ashy on head; crown patch orange brown, more or less concealed; greenish yellow below; ♀ duller, sometimes without crown patch; L. 4¾; W. 2¼; T. 2. Miss. Valley, S. & W.; rare E.

5. ***H. peregrina,*** (Wils.) Cab. Tennessee Warbler. Olive green; no crown patch; white or slightly yellowish below; L. 4½; W. 2¾; T. 1¾. E. U. S., not common.

6. PERISSOGLOSSA, Baird. Fringed Tongue Warblers.

1. ***P. tigrina,*** (Gm.) Bd. Cape May Warbler. Olivaceous above with darker streaks; rump and sides of neck bright yellow; yellow below, much streaked with black; crown black or nearly so; ear coverts orange brown, a white wing patch; ♀ duller, with no black or reddish about head; L. 5¼; W. 2¾; T. 2. E. U. S., rather rare. A fine species with a peculiar structure of the tongue, which is somewhat as in *Cœrebidæ*.

7. DENDRŒCA, Gray. Wood Warblers.

A large genus comprising about thirty species of brightly colored little birds, all American, and very abundant in the United States during the migrations.

Our species, though well marked, are often difficult to determine when not in full plumage. The tail feathers are always marked with white or yellow, and the bill is but moderately pointed, notched and with evident bristles at the rictus.

The following artificial analysis, partially borrowed from Coues' key to the genus, will generally enable the student to distinguish specimens.

* Tail feathers edged with yellow; plumage chiefly yellow. *æstiva*, 1.

** Tail feathers blotched with white.

† A white blotch on the primaries near their bases; no wing bars. . . . . *cærulescens*, 2.

†† No white blotch on primaries; wing bars, if present, not white.

White below; crown and wing patch more or less yellow. *pennsylvanica*, 6.

Yellow below; sides reddish-streaked; crown reddish. *palmarum*, 15.

Yellow below, sides black-streaked.

Back olive with reddish spots. . . . *discolor*, 12.

Back ashy. . . . . *kirtlandi*, 11.

††† No white blotch on primaries; wing bars or wing patch white.

‡ Rump yellow: —crown clear ash; yellow and streaked below. . . . . *maculosa*, 4.

—Crown with yellow spot; white and streaked below. . *coronata*, 3.

‡‡ Rump not yellow.

Crown with orange or yellow spot; throat orange or yellow. *blackburniæ*, 9.

Crown black; no distinct yellow any where: much streaked. *striata*, 8.

Crown blue or greenish, like the back; no definite yellow. *cærulea*, 5.

Crown chestnut, like the throat; no definite yellow; buffy below. . . . . *castanea*, 7.

Crown bluish or yellowish, not as above—some yellow.
  Throat black (sometimes obscured by yellow tips to feathers); outer tail feather white-edged. *virens*, 13.
  Throat yellow; —back ashy blue; cheeks black. *dominica*, 10.
    —back yellowish olive; cheeks same. *pinus*, 14.

We copy from Coues' key the following valuable

Diagnostic Marks of Warblers in any Plumage.

A white spot at base of primaries.	*cærulescens*, 2.
Wings and tail dusky, edged with yellow.	*æstiva*, 1.
Wing bars and belly yellow.	*discolor*, 12.
Wing bars yellow and belly pure white.	*pennsylvanica*, 6.
Wing bars white and tail spots oblique, at end of two outer feathers only.	*pinus*, 14.
Wing bars brownish; tail spots square at end of two outer feathers only.	*palmarum*, 15.
Wing bars not evident (?); whole under parts yellow; back with no greenish.	*kirtlandi*, 11.
Tail spots at end of nearly all the feathers, and no definite yellow any where.	*cærulea*, 5.
Tail spots at middle of nearly all the feathers; rump and belly yellow.	*maculosa*, 4.
Rump, sides of breast (usually) and crown with yellow; throat white.	*coronata*, 3.
Throat definitely yellow; belly white; back with no greenish.	*dominica*, 10.
Throat yellow or orange; crown with at least a trace of a central yellow or orange spot, and outer tail feather white-edged externally.	*blackburniæ*, 9.
Throat, breast and sides black, or with black traces (seen on parting the feathers); sides of head with diffuse yellow; outer tail feather white-edged externally.	*virens*, 13.
With none of the foregoing special marks.	*striata* 8 or *castanea* 7.

1. ***D. æstiva,*** (Gm.) Bd. Summer Warbler. Golden Warbler. Chiefly golden yellow; back olive yellow; breast and sides with orange brown streaks; quills dusky, edged with yellow; ♀ similar, scarcely streaked; L. 5¼; W. 2½; T. 2¼. America; every where abundant.

2. ***D. cœrulescens,*** (L.) Bd. Black-Throated Blue Warbler. Rich gray blue, with a few dusky streaks on back; throat, sides of head, neck and sides of body black, otherwise pure white below; quills black, edged with blue; ♀ dull olive greenish, obscurely marked, known by the blotch on the primaries; L. 5½; W. 2¾; T. 2¼. E. U. S.; an elegant species, not uncommon in woodland.

3. ***D. coronata,*** (L.) Gray. Yellow-Rumped Warbler. Myrtle Warbler. Bluish ash above, streaked with black; white below with large blackish streaks; crown patch, rump and sides of breast bright yellow, there being four definite yellow places; ♀ and young brownish, with less yellow on breast and head; L. 5¾; W. 3; T. 2½. U. S., very abundant. The earliest migrant.

4. ***D. maculosa,*** (Gm.) Bd. Black and Yellow Warbler. Magnolia Warbler. Back black, with olive skirtings; rump yellow; head clear ash; a white stripe behind eye; sides of head black, under parts (except the white crissum) rich yellow, with black streaks which are confluent on breast; ♀ similar, more olivaceous, with much less black; L. 5; W. 2½; T. 2¼. E. U. S. A brilliant little bird, common in woodlands.

5. ***D. cœrulea,*** (Wils.) Bd. Cærulean Warbler. Bright blue with black streaks; white below; breast and sides with bluish lines; ♀ not streaked, greenish above, slightly yellowish below; L. 4¼; W. 2½; T. 2. E. U. S.; N. to Niagara Falls; rather rare. A dainty species.

6. ***D. pennsylvanica,*** (L.) Bd. Chestnut-Sided Warbler. Blackish above; much streaked; crown clear yellow; black patch about eye; pure white below; a line of bright chestnut streaks along sides; wing patch yellowish (never clear white); ♀ similar but with less chestnut and black; L. 5; W. 2½; T. 2¼. E. U. S.; abundant, especially northward. A pretty species.

7. ***D. castanea,*** (Wils.) Bd. Bay-Breasted Warbler. Autumn Warbler. Back black and olive; thickly streaked; forehead and sides of head black enclosing a deep chestnut crown patch; chin, throat and sides, dull chestnut, otherwise pale buffy below; ♀ more olivaceous with less chestnut; young scarcely distinguishable from *striata;* L. 5; W. 3; T. 2½. E. U. S. Not very common.

8. ***D. striata,*** (Forst.) Bd. Black-Poll Warbler. Black and olivaceous, almost every where streaked; whole crown pure black; ♀ more olivaceous, slightly yellowish below; rather large; L. 5¾; W. 3; T. 2¼. E. U. S.; the last to migrate. "When the Black-Polls appear in force, the collecting season is about over" (*Coues.*)

9. ***D. blackburniæ,*** (Gm.) Bd. Orange-Throated Warbler. Blackburnian Warbler. Hemlock Warbler. Black above with whitish streaks; crown patch, superciliary line, sides of neck and the whole throat brilliant orange or flame color, fading into yellowish on the belly; ♀ similar, but olive and bright yellow instead of black and orange; L. 5½; W. 2¾; T. 2¼. E. U. S.; abundant among the tree-tops. The most brilliant species.

10. ***D. dominica,*** (L.) Bd. Yellow-Throated Warbler. Ashy blue; throat bright yellow; belly white; cheeks black; superciliary line white or yellowish in front; L. 5; W. 2¾: T. 2⅓. Southern States; N. to

Penn., Central Indiana and Kansas; rare northward. A neat, plain species, with the habits of a creeper.

11. ***D. kirtlandi,*** Bd. Kirtland's Warbler. Ashy blue above; yellow and streaked below; lores black; L. 5½; W. 2¾; T. 2⅔. Ohio and the Bahamas. Two or three specimens known.

12. ***D. discolor,*** (Vieill.) Bd. Prairie Warbler. Olive yellow; back with a patch of red spots; forehead, superciliary line, wing bars and under parts bright yellow; streaked below; sides of head with black; ♀ similar; L. 4¾; W. 2¼; T. 2. E. U. S., N. to Mass. and Ills.; chiefly in evergreen thickets. An elegant species.

13. ***D. virens,*** (Gm.) Bd. Black-Throated Green Warbler. Clear yellow olive; sides of head rich yellow; whole throat and breast jet black, the color extending along the sides; otherwise whitish below; ♀ and winter birds with the black interrupted or veiled with yellowish; L. 5; W. 2½; T. 2¼. E. U. S.; abundant.

14. ***D. pinus,*** (Wils.) Bd. Pine-Creeping Warbler. Yellow olive above; under parts and superciliary line yellow; no sharp markings any where; ♀ more grayish; L. 5⅔; W. 3; T. 2⅓. E. U. S., N. to Mass. and L. Superior; abundant in evergreen forests.

15. ***D. palmarum,*** (Gm.) Bd. Yellow Red-Poll Warbler. Palm Warbler. Brownish olive above, somewhat streaked, rump brighter; crown bright chestnut; superciliary line and under parts yellow with brown streaks; no wing bars; ♀ similar; L. 5; W. 2⅔; T. 2¼. E. N. A.; abundant; terrestrial; less beautiful than most of the group.

8. ***SIURUS,*** Swainson. Water Thrushes.

1. ***S. auricapillus,*** (L.) Sw. Golden-Crowned Thrush. Oven-Bird. Bright olive green, white

below, sharply spotted on breast and sides, after the fashion of the Thrushes; crown orange brown, with two black stripes; L. 6¼; W. 3; T. 2½. U. S.; abundant in woodland, spending most of its time on the ground, like the other species of this genus, and the next two; remarkable for its loud, ringing song, and its curious oven-shaped nest; the largest of the true Warblers.

2. **S. nœvius,** (Bodd.) Coues. WATER WAGTAIL. WATER THRUSH. Dark olive brown above, pale yellowish beneath; thickly spotted every where with the color of the back; a yellowish superciliary line; bill about a half inch long; feet dark; L. 6; W. 3; T. 2⅓. N. Am.; abundant in low thickets; moves its tail like a Wagtail.

3. **S. motacilla,** (Vieill.) Bon. LARGE-BILLED WATER THRUSH. Same general color as last, but white or pale buffy below, and less sharply spotted; bill much larger, about ¾ inch; feet pale; larger; L. 6¼; W. 3¼; T. 2⅓. E. U. S., scarce; N. to Mass. (*Allen*) and N. Wis. (*Jordan.*) (*S. ludovicianus*, authors.)

9. OPORORNIS, Baird. NIMBLE WARBLERS.

1. **O. agilis,** (Wils.) Bd. CONNECTICUT WARBLER. Olive green, ashy on head; throat and breast brownish ash, otherwise yellow below; no sharp markings; in fall more olivaceous; L. 5¾; W. 3; T. 2¼. E. U. S., rare; a shy, quiet bird.

2. **O. formosus,** (Wils.) Bd. KENTUCKY WARBLER. Clear olive green, bright yellow below; crown and sides of head and neck black, with a rich yellow superciliary stripe, which bends around the eye behind; L. 5¾; W. 3; T. 2¼. E. U. S., chiefly southerly, N. to Wis. and Conn.; in low thickets, not generally common; a handsome and active species.

10. GEOTHLYPIS, Cabanis. GROUND WARBLERS.

1. ***G. trichas***, (L.) Cab. MARYLAND YELLOW THROAT. BLACK-MASKED GROUND WARBLER. Olive green; forehead and broad mask extending down sides of head and neck jet black, bordered behind with clear ash; under parts yellow, clear on throat and breast; ♀ obscurely marked, without black mask and with less yellow; L. 4½; W. 2¼; T. 2⅓. U. S., abundant in thickets; a pretty bird with a lively song.

2. ***G. philadelphia***, (Wils.) Bd. MOURNING WARBLER. Bright olive, clear yellow below; head ashy; throat and breast black, the feathers usually ashy-skirted (as though the bird wore crape, hence "Mourning Warbler"); ♀ and ♂ not in full plumage almost exactly like *O. agilis*, but the tail as long as wings; L. 5½; W. 2¼; T. 2¼. E. U. S., rather rare, in dense thickets.

11. ICTERIA, Vieillot. YELLOW-BREASTED CHATS.

1. ***I. virens***, (L.) Bd. YELLOW-BREASTED CHAT. Olive-green; throat and breast bright yellow; belly abruptly white; lores black, a white superciliary line; wings and tail plain; tarsus almost booted; L. 7⅓; W. 3¼; T. 3⅓. U. S., southerly; N. to Mass. and Wis. (*Copeland.*) A loud, quaint songster, often placed with the *Vireos*, but having little affinity with any of our groups.

12. MYIODIOCTES, Audubon. FLY-CATCHING WARBLERS.

1. ***M. mitratus***, (Gm.) Bon. HOODED FLY-CATCHING WARBLER. YELLOW-MASKED WARBLER. Bright yellow-olive, crown and neck all around jet black, enclosing a broad golden mask; under parts from the breast bright yellow; tail with white blotches; ♀ olive instead of

black; L. 5; W. $2\frac{3}{4}$; T. $2\frac{1}{2}$. E. U. S., southerly; N. to L. Erie; a singular species.

2. ***M. pusilus,*** (Wils.) Bon. Green Black-Capped Fly-Catching Warbler. Clear yellow-olive; crown glossy black; forehead, lores, sides of head and entire under parts bright yellow; wings and tail unblotched; ♀ with less black; L. $4\frac{3}{4}$; W. $2\frac{1}{2}$; T. $2\frac{1}{4}$. U. S.; abundant.

3. ***M. canadensis,*** (L.) Aud. Canada Fly-Catching Warbler. Bluish ash; crown speckled with black; under parts (except white crissum) clear yellow; lores black, continuous with black under the eye, and this passing as a chain of black streaks down the side of the neck and encircling the breast like a necklace; wings and tail plain; ♀ similar, with less black; L. $5\frac{1}{3}$; W. $2\frac{3}{4}$; T. $2\frac{1}{2}$. E. U. S., to the Missouri, frequent. One of the handsomest Warblers.

13. SETOPHAGA, Swainson. American Redstarts.

1. ***S. ruticilla,*** (L.) Sw. Redstart. Black; sides of breast and large blotches on wings and tail orange-red; belly white, reddish tinged; ♀ olive, similarly marked with reddish yellow; L. $5\frac{1}{4}$; W. $2\frac{1}{2}$; T. $2\frac{1}{2}$. E. U. S., very abundant. A handsome and active Fly-Catcher.

FAMILY XXVIII.—TANAGRIDÆ.

(The Tanagers.)

Primaries 9; bill usually conical, sometimes depressed or attenuated, the culmen curved; cutting edges not much inflected, sometimes toothed, notched or serrated; tarsus scutellate. Legs short; claws long; colors usually brilliant. A large family of three hundred or more species, confined to the warmer parts of America, and embracing a wide diversity of forms. Some have slender bills and are scarcely distinguishable from the Warblers.

Others, like our *Pyranga*, have stout conical bills and are very closely related to the Finches. The single North American genus has a stout, sparrow-like bill, notched at the tip, and more or less evidently toothed or lobed near the middle of the upper mandible.

1. ***PYRANGA,*** Vieillot. FIRE TANAGERS.

1. ***P. rubra,*** (L.) Vieill. SCARLET TANAGER. ♂ brilliant scarlet; wings and tail black, no wing bars; ♀ clear olive green; clear greenish yellow below; L. 7½; W. 4; T. 3. E. U. S.; abundant in woodland; a respectable songster.

2. ***P. œstiva,*** (L.) Vieill. SUMMER RED BIRD. ♂ bright rose red throughout; wings a little dusky; ♀ dull brownish olive, dull yellowish below; no wing bars; bill and feet paler than in *P. rubra;* size of last. E. U. S., chiefly southerly; N. to N. J. and Ills.; abundant.

FAMILY XXIX.—HIRUNDINIDÆ.

(*The Swallows.*)

Primaries 9; bill "fissirostral," *i.e.*, short, broad, triangular, depressed, the gape wide and about twice as long as the culmen, reaching to about opposite the eyes. Wings very long and pointed, the first primary usually longest, and twice as long as the last; secondaries very short. Tail more or less forked. Feet weak; tarsus scutellate, shorter than middle toe and claw. Plumage compact, and more or less lustrous.

A very natural family of about one hundred species, found all over the world. All are strong on the wing, insectivorous, and usually migratory.

* Plumage above more or less lustrous blue-black or green; no tarsal tuft nor recurved hooks on outer primary.

† Tail deeply forked; outer feathers attenuate and blotched with white. . . . . CHELIDON, 1.

†† Tail scarcely forked; rump and forehead not colored like the back. . . . . PETROCHELIDON, 3.

††† Tail somewhat forked, unblotched; rump and forehead colored like the back.

a. Lustrous green or violaceous; pure white below; length less than 6½. . . . . . . TACHYCINETA, 2.

aa. Lustrous blue-black; ♀ paler and whitish below; length more than 6½. . . . . . PROGNE, 6.

** Plumage brownish-gray; scarcely lustrous and without shades of blue or green.

b. A little tuft of feathers on tarsus at base of hind toe; edge of wing smooth. . . . . RIPARIA, 4.

bb. Outer web of first primary more or less saw like, with a series of minute recurved hooks, no tarsal tuft.
STELGIDOPTERYX, 5.

1. CHELIDON, Forster. SWALLOWS.

1. ***C. erythrogastra,*** Bodd. BARN SWALLOW. Lustrous steel-blue, pale chestnut below; forehead and throat deep chestnut; an imperfect steel-blue collar; tail very deeply forked; L. 7; W. 5; T. 4½. N. Am., abundant; breeding in colonies about barns, etc.

2. TACHYCINETA, Cabanis. WHITE-BELLIED SWALLOWS.

1. ***T. bicolor,*** (Vieill.) Coues. WHITE-BELLIED SWALLOW. Lustrous green, pure white below; ♀ duller; L. 6¼; W. 5; T. 2⅔. N. Am., abundant about water, nesting in trees, etc.; a handsome swallow.

3. PETROCHELIDON, Cabanis. CLIFF SWALLOWS.

1. ***P. lunifrons,*** (Say) Cab. CLIFF SWALLOW. EAVE SWALLOW. Lustrous steel blue; forehead, sides of head, throat, rump, etc., of various shades of chestnut; a blue spot on breast, belly whitish; L. 5⅛; W. 4½; T. 2⅓. N. Am., abundant, formerly nesting in cliffs, but now under the eaves of barns, etc.

4. RIPARIA, Forster. BANK SWALLOWS. (*Cotyle* Boie.)

1. ***R. riparia,*** (L.) BANK SWALLOW. SAND MARTIN. Dark gray, not iridescent, white below, a brown shade across the breast; L. 4¾; W. 4; T. 2. N. Am., abundant, breeding in holes in sandbanks, etc.

5. STELGIDOPTERYX, Baird. ROUGH-WINGED SWALLOWS.

1. ***S. serripennis,*** (Aud.) Bd. ROUGH-WINGED SWALLOW. Brownish gray; wing hooks weak in ♀; L. 5⅓; W. 4½; T. 2¼. U. S., not common, rare eastward, breeding in banks, etc.

6. PROGNE, Boie. MARTINS.

1. ***P. subis,*** (L.) Bd. PURPLE MARTIN. Lustrous blue-black throughout; ♀ duller, whitish and streaky below; bill stout, almost hooked; L. 7½; W. 6; T. 3⅓. N. Am., abundant. (*P. purpurea*, Auct.)

FAMILY XXX.—AMPELIDÆ.

(*The Chatterers.*)

Primaries 10, or apparently 9, the first sometimes rudimentary and displaced; bill stout, triangular, depressed, decidedly notched and hooked, with the gape very wide. Nostrils overhung by membrane covered with bristly feathers. Tarsus short, with the lateral plates more or less subdivided, and often scarcely oscine in character; lateral toes nearly equal. As here constituted, a small group of six or eight species, the *Myidestinæ* usually brought into this connection being really *Turdidæ*, as shown by Prof. Baird. There are two sub-families, bearing but little resemblance to each other,—*Ptilogonydinæ*, of the warmer parts of N. America, and *Ampelinæ*, of the northern parts of both hemispheres.

The *Ampelinæ* constitute a single genus of three species. All are crested birds with a soft plumage of a handsome cinnamon drab color; the ends of the secondaries, and sometimes of the tail feathers, also, are tipped with horny appendages, looking like red sealing-wax.

The tail is short and square, much shorter than the long wings, and in our species it is tipped with yellow. The Wax Wings are migratory and gregarious, feeding on insects and soft fruits. Their voices are weak and wheezy, and they can scarcely be considered as songsters.

1. ***AMPELIS,*** Linnæus. WAX WINGS.

1. ***A. garrulus,*** L. BOHEMIAN WAX WING. NORTHERN WAX WING. General color an indescribable silky, ashy brown with a red tinge; front and sides of head shaded with purplish cinnamon; a black band across forehead around head; throat black; crissum chestnut red; two broad white wing bars; L. 7⅓; W. 4½; T. 3. Northern regions, S. in winter in large flocks to the Great Lakes; an interesting and beautiful bird.

2. ***A. cedrorum,*** (Vieill.) Bd. CEDAR BIRD. CHERRY BIRD. SOUTHERN WAX WING. Similar but smaller and less cinnamon-tinged, chin black; strip across face black, bordered above by whitish; belly yellowish; crissum white; no wing bars; ♀ with the wax-like appendages small or wanting; L. 6½; W. 3¾; T. 2½. E. U. S., abundant.

FAMILY XXXI.—VIREONIDÆ.

(*The Vireos.*)

Primaries 10, or apparently only 9, the first being sometimes rudimentary and displaced. Bill shorter than head, stout, compressed, decidedly notched and hooked.

Rictus with bristles. Nostrils exposed, overhung by a scale, reached by the bristly frontal feathers. Tarsus scutellate; toes soldered at base for the whole length of basal joint of middle one, which is united with the basal joint of the inner and the two basal joints of the outer; lateral toes usually unequal.

A rather small family, comprising sixty or seventy species of small olivaceous birds, all American. The coloration is usually blended and varies little with age or sex. All are insectivorous, and many of them are remarkable as songsters.

Concerning the "nine-primaried" species, Prof. Baird remarks: "In *V. flavifrons*, in which the outer primary is supposed to be wanting, its presence may be easily appreciated. One of the peculiar characters of this species consists in a narrow edging of white to all the primary quills, while the primary coverts (the small feathers covering their bases, as distinguished from what are usually termed the wing coverts, which more properly belong to the forearm or secondaries) are without them. If these coverts are carefully pushed aside, two small feathers considerably shorter than the others will be disclosed, one overlying the other, which (the under one) springs from the base of the exposed portion of the long outermost primary, and lies immediately against its outer edge. This small feather is stiff, falcate, and edged with white like the other quills, and can be brought partly around on the inner edge of the large primary, when it will look like any spurious quill. The overlying feather is soft, and without light edge.

In the other Vireos, with appreciable spurious or short outer primary, a similar examination will reveal only one small feather at the outer side of the base of the exterior large primary.

In all the families of Passeres, where the existence of nine primaries is supposed to be characteristic, I have invariably found, as far as my observations have extended, that there were two of the small feathers referred to, while in those of ten primaries but one would be detected."

* Wings long and pointed, ¼ or more longer than the tail; first primary very small or apparently wanting, less than ⅓ length of second. . . . . . . VIREOSYLVIA, 1.

** Wings relatively short and rounded, not one-fourth longer than the tail; first primary ⅔ or more length of second; bill stout. . . . . VIREO, 2.

1. ***VIREOSYLVIA,*** Bonaparte. LONG-WINGED VIREOS.

< *Vireo*, Vieillot.

* Slender species, the bill slender, light horn color, pale below; commissure straight and culmen relatively so; no wing bars nor conspicuous orbital ring; feet weak. (*Vireosylvia*)

† Primaries apparently 9.

1. ***V. olivacea,*** (L.) Bon. RED-EYED VIREO. GREENLET. Olive green, crown ashy, edged on each side with blackish; a white superciliary line, and below this a dusky streak; white below, somewhat olive shaded; eyes red; L. 6; W. 3⅓; T. 2½. E. U. S., very abundant in woodland; an energetic songster.

2. ***V. philadelphica,*** Cassin. PHILADELPHIA GREENLET. Dull olive green, becoming ashy on crown; no black lines on head; a whitish superciliary line; below faintly yellowish, fading to white on throat, etc.; L. 4¾; W. 2⅔; T. 2¼. E. U. S., scarce.

†† Primaries evidently 10.

3. ***V. gilva,*** (Vieill.) Cass. WARBLING VIREO. Colors exactly as in the preceding, but the spurious quill evident; L. 5⅓; W. 2¾; T. 2¼. E. N. A., frequent; an exquisite songster, nesting in tall trees in cities, etc.

** Stout species; the bill short and stout, blue-black; both culmen and commissure decidedly curved; a pale stripe running from bill to and around eye; white wing bars; quills blackish, mostly edged with white; feet stout. (*Lanivireo*, Bd.)

‡ Primaries apparently 9.

4. ***V. flavifrons,*** (Vieill.) Baird. Yellow-Throated Vireo. Rich olive green above, becoming ashy on rump; bright yellow below; belly white; superciliary line and orbital ring yellow; L. 5$\frac{3}{4}$; W. 3; T. 2. E. U. S., abundant; a brightly colored species.

‡‡ Primaries evidently 10.

5. ***V. solitaria,*** (Wils.) Baird. Blue-Headed Vireo. Solitary Greenlet. Bright olive green; crown and sides of head bluish ash; stripe to and around eye white, a dusky line below it; white below, somewhat washed with pale yellow; L. 5$\frac{2}{3}$; W. 3; T. 2$\frac{1}{3}$. U. S., in woodland, frequent; a stout, handsome species.

2. *VIREO,* Vieillot. Short-Winged Vireos.

1. ***V. noveboracensis,*** (Gm.) Bonap. White-Eyed Vireo. Bright olive green, white below; sides and crissum bright yellow; pale wing bars; stripe from bill to and around eye, yellow; eyes white; L. 5; W. 2$\frac{1}{3}$; T. 2$\frac{1}{4}$. E. U. S., in thickets; a sprightly bird, with a loud and varied song.

2. ***V. belli,*** Aud. Bell's Vireo. Olive-green, yellow below, chin and superciliary line whitish; wing bars whitish; L. 4$\frac{1}{4}$; W. 2$\frac{1}{5}$; T. 2. Western, E. to Ills. and Neb. Resembles *V. gilva.*

FAMILY XXXII.—LANIIDÆ.

(The Shrikes.)

Primaries 10, the first short (rarely wanting); bill hawk-like, very strong, the upper mandible toothed and abruptly hooked at the tip; both mandibles distinctly notched. Wings short, rounded. Tail long. Tarsus scutellate on the outside as well as in front. Sexes alike.

Species about 100, found in most parts of the world, remarkable for their energy and pugnacity.

* Rictus with bristles; nostrils concealed by bristly tufts; colors black, white and gray. . . . . Lanius, 1.

1. ***LANIUS,*** Linnæus. Shrikes.

(*Collurio*, Vigors.)

1. ***L. borealis,*** Vieill. Great Northern Shrike. Butcherbird. Clear bluish ash above; black bars on side of head *not* meeting in front, interrupted by a white crescent on under eyelid; rump and shoulders whitish; wings black; white below, waved with blackish; L. $9\frac{1}{2}$; W. $4\frac{1}{4}$; T. $4\frac{3}{4}$. Northern regions, S in winter to Ohio R. and Potomac.

2. ***L. ludovicianus,*** (L.) var. ***excubitoroides,*** (Sw.) Coues. Loggerhead Shrike. Clear ashy blue; a whitish superciliary line; black bars on sides of head meeting across forehead; no crescent on under eyelid; white below scarcely or not dark-waved; L. $8\frac{1}{4}$; W. 4; T. $4\frac{1}{4}$. Western, E. to L. Michigan and Ohio R. (See Addenda.)

FAMILY XXXIII.—FRINGILLIDÆ.

(*The Finches.*)

Primaries 9. Tarsus strictly oscine. Bill mostly shorter than head, robust, of a conical form, with the commissure more or less abruptly angulated near its base; in other words, the "corners of the mouth drawn down." This feature is usually unmistakeable, and it is almost the only character pertaining to all the members of the family. Even this is also shared by the *Icteridæ*, which, however, may generally be distinguished by the greater length and slenderness of the bill.

A very large family, the most extensive in Ornithology, comprising about one hundred genera and five hundred species, found in nearly every part of the world, except Australia. They are especially abundant in North America, where about one-eighth of all the birds are *Fringillidæ.* "Any one United States locality of average attractiveness to birds, has a bird-fauna of over two hundred species, and if it be away from the sea-coast, and consequently uninhabited by marine birds, about one-fourth of the species are *Sylvicolidæ* and *Fringillidæ* together, the latter somewhat in excess of the former. It is not easy, therefore, to give undue prominence to these two families." (*Coues.*)

All the Finches are granivorous, feeding chiefly on seeds, but not rejecting either berries or insects; nearly all sing, and some most delightfully; most of them are plainly clad, a streaky brown being the prevailing tint, but others are among the most brilliantly colored birds. Among these latter only are the changes in plumage strongly marked.

The following key to the genera is about as artificial as it well could be, but a more natural one would be less easy of application. The characters here assigned are seldom truly generic.

* Species of large size; length at least more than 7½.

† Tail longer than wings.

a. Conspicuously crested, chiefly red or rosy-tinted; bill very large, reddish. . . . . . CARDINALIS, 23.

aa. Not crested; black or brown with chestnut on sides; wings and tail with white; bill moderate, black. PIPILO, 24.

aaa. Not crested, head mostly black; no white on tail. ZONOTRICHIA, 13.

†† Tail shorter than wings.

b. Bill very large and stout. ("*Grosbeaks.*")

c. Black and white (♂) or brown, streaked (♀); under wing coverts rosy or yellow. . . . ZAMELODIA, 20

cc. Rosy red (♂) or gray with brownish yellow on head and rump (♀). . . . . PINICOLA, 2.

ccc. Bill greenish yellow, as long as tarsus; wings and tail black; secondaries mostly white. HESPERIPHONA, 1.

bb. Bill moderate or small.

d. White, with black on wings and tail, or washed with clear brown; hind toe elongated. CALCARIUS, 7.

dd. Streaked above; head striped; tail about as long as wings. . . . . . . ZONOTRICHIA, 13.

** Species of medium or small size; length 7¼ or less.

‡ Mandibles long and much curved, their points crossed; colors chiefly red or olive. . . . . . . LOXIA, 4.

‡‡ Hind claw straightish, twice as long as middle claw; colors black, white and brown. . . CALCARIUS, 7.

‡‡‡ With neither of the preceding combinations.

e. No where *decidedly* spotted or streaked (sometimes appearing mottled owing to the darker centers of the feathers).

f. Blackish, or ashy; belly and one to three outer tail feathers white; bill pale, without ruff. . JUNCO, 17.

ff. Yellow, more or less; base of bill with a small ruff; no blue; young brownish. . . CHRYSOMITRIS, 6.

fff. Chiefly or entirely blue (♂), greenish or plain brown (♀).

g. Length more than 6; wings with chestnut or whitish; bill stout. . . . . . GUIRACA, 21.

gg. Length 5 to 6; gonys usually with a dusky stripe. PASSERINA, 22.

ee. Some where or every where decidedly spotted or streaked.

h. One or more outer tail feathers partly or wholly white.

i. Hind claw very long and nearly straight; colors black and white or brown. . . CALCARIUS, 7.

ii. Hind claw not specially elongated.

j. Bend of wing with chestnut; crown and breast streaked; tail much shorter than wings. POŒCETES, 10.

jj. No chestnut on wing; breast unstreaked; head with black, white and chestnut; tail nearly as long as wings. . . . . . . Chondestes, 12.

hh. Tail feathers rigid, acute, almost scansorial; small streaked marsh-sparrows with yellow-edged wings. Ammodramus, 11.

hhh. Tail feathers more or less rounded and soft, none of them white.

k. Wings *decidedly* longer than tail.

l. With crimson or clear (not rusty) red; a ruff at base of bill.

m. Crown crimson; Chin dusky. . Acanthis, 5.

mm. Crown, chin, throat and often whole plumage washed with red. . . ♂ of Carpodacus, 3.

ll. With definite yellow some where.

n. Bases and edges of quills and tail feathers yellow; bill acute. . . . Chrysomitris, 6.

nn. Rump sulphur yellow; bill with a small ruff. Acanthis, 5.

nnn. Edge of wing and superciliary line or spot at least, yellow or yellowish; no ruff.

o. Breast yellow; throat patch or streaks black, bill bluish. . . . . Spiza, 19.

oo. Breast buffy or streaky; wings less than 2½; tail feathers narrow. . Ammodramus, 11.

ooo. Breast streaked; wings more than 2½; inner secondaries nearly as long as primaries. Passerculus, 9.

lll. With no definite crimson nor yellow any where.

p. Introduced birds, not streaked below; throat black in ♂. . . . . Passer, 8.

pp. Native birds, much streaked below.

q. Inner claw reaching at least half way to tip of middle claw; tail, wings, etc., with much chestnut red; wings more than 3; no ruff. Passerella, 18.

qq. Olivaceous; no black nor chestnut; wings more than 3; secondaries not lengthened; a ruff at base of bill. . . ♀ of CARPODACUS, 3.

qqq. Inner secondaries lengthened, about as long as primaries; wings less than 3; no ruff. PASSERCULUS, 9.

kk. Wings little if any longer than tail.

r. Tail feathers very slender, rather stiff and sharp pointed. . . . . AMMODRAMUS, 11.

rr. Tail feathers not rigid and sharp pointed.

s. Sharply streaked below. . . MELOSPIZA, 15.

ss. Not streaked below (when adult.)

t. Crown chestnut in adult (streaky in young); no yellow.

u. Tail rounded; its middle feathers longest; sharply streaked above. MELOSPIZA, 15.

uu. Tail forked; its middle feathers short. SPIZELLA, 14.

tt. Crown not chestnut in adult, often partially so in young.

v. Head striped; length more than 6; tarsus more than ¾. . . ZONOTRICHIA, 13.

vv. Length less than 6; bend of wing yellowish. PEUCÆA, 16.

1. HESPERIPHONA, Bonaparte. EVENING GROSBEAKS.

1. ***H. vespertina,*** (Coop.) Bon. EVENING GROSBEAK. Olivaceous; crown, wings, tail and tibia black; forehead and crissum yellow; bill very large, yellowish; L. 8; W. 4¼; T. 2½. Western, E. to Ohio, etc.

2. PINICOLA, Vieillot. PINE GROSBEAKS.

1. ***P. enucleator,*** (L.) Vieill. PINE GROSBEAK. ♂ chiefly red; white wing bars; ♀ ashy gray with brownish yellow on head and rump; L. 8½; W 4½; T. 4. Northward, S. in winter; in pine woods, etc.

3. *CARPODACUS*, Kaup. Purple Finches.

1. ***C. purpureus,*** (Gmel.) Gray. Purple Finch. Every where streaky; ♂ flushed with red, most intense on the crown, fading below and behind; ♀ olive brown with no red; bill stout; L. 6; W. $3\frac{1}{3}$; T. $2\frac{1}{2}$. U. S., a fine songster.

4. *LOXIA*, Linnæus. Crossbills.

1. ***L. leucoptera,*** (Gmel.) White Winged Crossbill. ♂ rose red; white wing bars; ♀ brownish olive, speckled with dusky; rump yellow; L. $6\frac{1}{4}$; W. $3\frac{1}{2}$; T. $2\frac{1}{2}$. Northern, S. in winter.

2. ***L. curvirostra,*** L. Red Crossbill. ♂ brick-red; wings unmarked; ♀ brownish olive; L. 6; W. $3\frac{1}{3}$; T. $2\frac{1}{2}$. Northern regions and pine woods; S. in winter.

5. *ACANTHIS*, Bechstein. Linnets.

1. ***A. linarius,*** (L.) Bech. Red Poll Linnet. Crown crimson in both sexes; throat, breast and rump also rosy in ♂; much streaked above; chin blackish; L. $5\frac{3}{4}$; W. 3; T. $2\frac{1}{2}$. Northern, S. in winter, in flocks.

2. ***A. flavirostris,*** (L.) var. ***brewsteri,*** Ridgway. Brewster's Linnet. No red on crown or breast; rump rosy in ♂; yellow in ♀; L. $5\frac{1}{2}$; W. 3; T. $2\frac{1}{2}$. Mass., lately discovered.

6. *CHRYSOMITRIS*, Boie. Goldfinches.

* Sexes alike; plumage thickly streaked every where; no black on head; bill very sharp. (*Chrysomitris.*)

1. ***C. pinus,*** (Wils.) Bon. Pine Linnet. Plumage streaky brown, suffused with yellow in the breeding season; bases of quills and tail feathers yellow, much as in the female Redstart; L. $4\frac{3}{4}$; W. $2\frac{3}{4}$; T. 2. N. Am., rather northward, but liable to "turn up" any where.

** Sexes unlike, scarcely or not streaked; adult ♂ with black on crown, wings and tail. (*Astragalinus*, Cab.)

2. ***C. tristis,*** (L.) Bon. YELLOW BIRD. THISTLE BIRD. AM. GOLDFINCH. ♂ rich yellow; rump whitish; wing bars white; white spot on each tail feather; ♀ more olivaceous; fall plumage pale yellow brown; young variously ochraceous, with yellow or not; L. 5; W. 3; T. 2. N. Am.; every where.

7. *GALCARIUS,* Bechst. LONGSPURS.

*Bill small, with a ruff; hind claw long but curved. (*Plectrophenax* Stejnegger.)

1. ***C. nivalis,*** (L.) SNOW BUNTING. SNOW FLAKE. In breeding season, pure white, with black on back, wings and tail; bill and feet black; in U. S. usually bill pale, and white of body clouded with clear, warm brown; L. 7; W. 4½; T. 3. Northern, S. in winter to Ohio R.; a beautiful bird.

**Bill larger, without ruff; hind claw nearly straight. (*Calcarius.*)

2. ***C. lapponicus,*** (L.) Stejn. LAPLAND LONGSPUR. ♂ with head and throat mostly black; a chestnut collar; back black and streaky, whitish below; outer tail feathers with white; legs and feet black; ♀ and winter birds with less black; L. 6¼; W. 4; T. 2¾. Northern, S. in winter to N. Y. and Ills.

3. ***C. pictus*** (Sw.) PAINTED LARK BUNTING. ♂ with head and upper parts mostly black; collar and under parts rich fawn color; legs pale; ♀ duller. Northern, S. in the interior to Ills. and Kans.; rare. (See Addenda.)

8. *PASSER,* Brisson. HOUSE SPARROWS.
= *Pyrgita*, Cuvier.

1. ***P. domesticus,*** L. ENGLISH SPARROW. ♂ chestnut

brown above, thickly streaked; ashy below; throat, lores and chin black; ♀ duller, without black; feet small; L. 6; W. 2¾; T. 2½. Introduced from Europe; abundant in the large cities.

2. ***P. montanus,*** Auct. EUROPEAN TREE SPARROW. "Distinguished by the chestnut crown, and the similarity of both sexes and the young." Introduced with preceding, and abundant in St. Louis (*Dr. J. C. Merrill*), and perhaps other places.

9. *PASSERCULUS,* Bonaparte. SAVANNA SPARROWS.

1. ***P. sandwichensis,*** (Gm.) SAVANNA SPARROW. Sharply streaked; streaks on back blackish; superciliary line and edge of wing yellowish; L. 5½; W. 2¾; T. 2. N. Am., abundant on plains and shores.

2. ***P. princeps,*** Maynard. IPSWICH SPARROW. Streaks on back sandy brown, not sharply defined; superciliary line white in front; L. 6; W. 3¼; T. 2½. Mass., lately discovered.

10. *POŒCETES,* Baird. GRASS SPARROWS.

1. ***P. gramineus,*** (Gm.) Baird. BAY-WINGED BUNTING. GRASS SPARROW. GROUND BIRD. Thickly streaked every where; slightly buffy below; L. 6; W. 3; T. 2½. N. Am., abundant in fields, etc., and known at once by the chestnut bend of wing and white outer tail feathers.

11. *AMMODRAMUS,* Swainson. SHORE SPARROWS.

* Bill stout; tail feathers acute but not rigid; crown with a medium light stripe; inland species. (*Coturniculus*, Bon.)

1. ***A. passerinus,*** (Wils.) Baird. YELLOW-WINGED SPARROW. Much streaked above; feathers edged with bay; breast buffy, unstreaked; wings and tail short; edge

and bend of wing and line over eye yellow; L. 5; W. 2⅔; T. 2. U. S., in fields; notes sharp, grasshopper-like.

2. ***A. henslowi,*** (Aud.) Baird. HENSLOW'S SPARROW. Smaller; more yellow above; breast, etc., with some sharp black streaks; L. 5; W. 2¼; T. 2⅕. E. U. S., scarce; N. to Mass.

3. ***A. lecontei,*** (Aud.) Baird. LE CONTE'S SPARROW. Intermediate between the preceding and the next; bill small, blue-black; back with rufous; tail feathers very sharp and slender; breast unspotted, a broad buffy superciliary stripe; L. 4⅔; W. 2⅕; T. 2⅓. Chicago, Ills. (*E. W. Nelson*) to Texas and N. W.; very rare.

** Bill long and slender; tail feathers sharp and rather stiff; sea-shore Sparrows. (*Ammodromus.*)

4. ***A. maritimus,*** (Wils.) Sw. SEA-SIDE FINCH. Olive gray; back obscurely streaked; a yellow spot over eye; L. 6; W. 2⅓; T. 2. Salt marshes, Atlantic coast.

5. ***A. caudacutus,*** (Gm.) Sw. SHARP-TAILED FINCH. Back sharply streaked; no yellow spot over eye, a bright buff superciliary stripe; L. 5; W. 2⅓; T. 1¾. Atlantic coast.

Var. ***nelsoni,*** Allen. NELSON'S SHARP-TAILED FINCH. Shores of Lake Michigan about Chicago; common. (*E. W. Nelson.*)

12. ***CHONDESTES,*** Swainson. LARK SPARROWS.

1. ***C. grammica,*** (Say.) Bon. LARK FINCH. Streaked above, ashy below; crown and ear coverts chestnut, blackening on forehead, with whitish median and superciliary stripes; black lines through and below eye; and a conspicuous black line on each side of the white throat; a black pectoral spot; middle tail feathers like back, the rest blackish, white tipped; L. 6½; W. 3½; T.

3. Western, E. to Ohio; abundant on prairies and river bluffs; a fine songster.

13. ***ZONOTRICHIA,*** Swainson. WHITE-CROWNED SPARROWS.

1. ***Z. leucophrys,*** (Forst.) Sw. WHITE-CROWNED SPARROW. Streaked above, with but little chestnut; crown with a broad white median band, a narrow black one and a white one on each side of it; no yellow any where; throat like breast; young with the crown chiefly rich brown; L. 7; W. 3¼; T. 3¼. N. Am.; less common than the next.

2. ***Z. albicollis,*** (Gm.) Bon. WHITE-THROATED SPARROW. PEABODY BIRD. Much chestnut streaking above; crown black, with white median and superciliary stripes; spot over eye and edge of wing always yellow; ashy below, whitening on throat; ♀ duller; L. 7; W. 3; T. 3⅕. E. N. Am.; an abundant and handsome sparrow.

3. ***Z. querula,*** (Nutt.) Gambel. BLACK-HOODED SPARROW. Crown, face and throat jet black; no yellow; ♀ with less black; L. 7½; W. 3¼; T. 3½. Missouri region, E. to Minn.

14. ***SPIZELLA,*** Bonaparte. CHIPPING SPARROWS.

1. ***S. montana,*** (Forst.) Ridgw. TREE SPARROW. Streaked above; crown chestnut; bill black above, yellow below; neck, line over eye and under parts ashy gray; a dark pectoral blotch; white wing bars; L. 6¼; W. 3; T. 3. N. Am., chiefly northerly; U. S. in winter.

2. ***S. pusilla,*** (Wils.) Bon. FIELD SPARROW. General color of preceding, but paler and duller; bill pale; wing bands rather obscure; L. 5½; W. 2⅓; T. 2⅓. E. U. S., abundant. [*S. agrestis*, (Bart.) Coues.]

3. ***S. socialis,*** (Wils.) Bon. Chippy. Hair Bird. Streaked above, with much dull bay; crown chestnut; bill, forehead and streak through eye black; ashy below; L. $5\frac{1}{4}$; W. $2\frac{2}{3}$; T. $2\frac{1}{2}$. N. Am., every where. [*S. domestica*, (Bart.) Coues.]

4. ***S. pallida,*** (Sw.) Bon. Clay-Colored Sparrow. Still smaller; pale brownish yellow, streaked with black; crown grayish, with median stripe. S. Ills. and W.

15. MELOSPIZA, Baird. Song Sparrows.

1. ***M. fasciata,*** (Gmel.) Scott. Song Sparrow. Much streaked above and on breast and sides; crown with an obscure pale median stripe; below white, pectoral streaks often forming a blotch; L. $6\frac{1}{2}$; W. $2\frac{1}{2}$; T. 3. U. S., every where; a well-known songster. [*M. melodia.*]

2. ***M. palustris,*** (Wils.) Baird. Swamp Sparrow. Crown chestnut; wings strongly tinged with chestnut; breast and below with few streaks or none; tail shorter than in the Song Sparrow; L. $5\frac{3}{4}$; W. $2\frac{1}{3}$; T. $2\frac{1}{3}$. E. U. S., in low thickets.

3. ***M. lincolni,*** (Aud.) Baird. Lincoln's Finch. Every where thickly, narrowly and sharply streaked; breast with a broad band of pale buffy or yellowish brown; sides washed with the same; L. $5\frac{1}{2}$; W. $2\frac{1}{2}$; T. $2\frac{1}{2}$. N. Am., rare eastward; a shy species quite unlike the others.

16. PEUCÆA, Audubon. Summer Sparrows.

1. ***P. æstivalis,*** (Licht.) Cab. Bachman's Finch. Much streaked above, ashy below; yellow on bend of wing but none on head; L. 6; W. $2\frac{1}{3}$; T. $2\frac{1}{2}$. Southern, N. to Illinois.

17. *JUNCO*, Wagler. SNOW BIRDS.

1. ***J. hyemalis,*** (L.) Scl. SNOW BIRD. ♀ more grayish; L. 6¼; W. 3; T. 3. E. N. Am., every where abundant, mostly seen in winter. (See Addenda.)

18. *PASSERELLA*, Swainson. FOX SPARROWS.

1. ***P. iliaca,*** (Merrem) Sw. FOX SPARROW. Ashy above, overlaid and much streaked with rusty red, which becomes bright bay on rump, tail and wings; white below with large arrow-shaped spots and streaks, numerous on breast; feet stout, with long claws; L. 7; W. 3½; T. 3. E. N. Am.; migrating early; one of the handsomest streaked sparrows.

19. *SPIZA*, Bonaparte. BLACK-THROATED BUNTINGS.

1. ***S. americana,*** (Gm.) Bon. BLACK-THROATED BUNTING. Grayish and streaked above; wing coverts chestnut; line over eye, maxillary stripe, edge of wing, breast and part of belly yellow; throat patch black; otherwise white below; ♀ with little chestnut, and the black reduced to a few streaks; L. 6¾; W. 3¼; T. 2¾. Meadows, etc., Conn. to Kansas, chiefly westward; a handsome bird with sleek plumage, and a peculiar, but scarcely musical song.

2. ***S. townsendi,*** (Aud.) Bon. TOWNSEND'S BUNTING. Upper parts, head, neck, etc., slaty blue; no chestnut, and little yellow or black. Smaller, a doubtful species. Only one specimen known from E. Penn.

20. *ZAMELODIA*, Coues. BLACK-HEADED GROSBEAKS.

= *Hedymeles*, Cabanis.

1. ***Z. ludoviciana,*** (L.) Coues. ROSE-BREASTED GROSBEAK. ♂ with head, neck and upper parts mostly black, with white on rump, wings and tail; belly white;

breast and under wing coverts of an exquisite rose-red; bill very stout, pale; ♀ olive brown, much streaked, with the under wing coverts saffron yellow; head with whitish bands; L. 8½; W. 4; T. 3¼. E. U. S., abundant; perhaps our handsomest bird, and one of our most brilliant songsters.

21. *GUIRACA,* Swainson. Blue Grosbeaks.

1. ***G. cærulea,*** (L.) Sw. Blue Grosbeak. ♂ rich blue; feathers about bill, wings and tail, black; wing bars chestnut; ♀ yellowish brown, with whitish wing bars; L. 7; W. 3½; T. 2¾. Southern, N. to N. Y. and Wis.; a fine songster.

22. *PASSERINA*, Vieill. Indigo Birds.

1. ***P. cyanea,*** (L.) Gray. Indigo Bird. ♂ Indigo blue, clear on head, greenish behind; ♀ plain warm brown, obscurely streaky, known from other small sparrows by a dusky line along the gonys; L. 5¾; W. 3; T. 2¾. E. U. S., abundant in summer; a tireless songster.

2. ***P. ciris,*** (L.) Gray. Nonpareil. Painted Bunting. ♂ head and neck blue; under parts, etc., vermillion; shoulders, etc., green; ♀ green, yellowish below; L. 5½. Southern, N. to S. Ills. (*Nelson.*)

23. *CARDINALIS,* Bonaparte. Cardinal Grosbeaks.

1. ***C. cardinalis,*** (L.) Cardinal Grosbeak. Red Bird. Clear red, ashy on back; chin and forehead black; crest conspicuous; ♀ ashy brown, more or less washed with red; L. 8½; W. 4; T. 4½. E. U. S., southerly, N. to Mass. and N. Wis.; abundant. A brilliant songster, much sought as a cage bird.

24. *PIPILO,* Vieillot. Towhee Buntings.

1. ***P. erythrophthalmus,*** (L.) Vieill. Chewink. Marsh

ROBIN. Black, belly white; sides chestnut; outer tail feathers, primaries, and inner secondaries with white; ♀ clear brown instead of black; L. 8½; W. 3½; T. 4. E. U. S., abundant every where.

FAMILY XXXIV.—ICTERIDÆ.

(*The Orioles.*)

Primaries 9; bill with the commissure angulated, as in *Fringillidæ*, but usually lengthened, rarely shorter than head, straight or gently curved, without notch or rictal bristles; culmen usually extending up on the forehead, dividing the frontal feathers. Legs stout, tarsus strictly oscine. Plumage usually brilliant or lustrous, predominant color generally black, often with red or yellow; females usually different, smaller in size, brown or streaky in the lustrous species, and yellowish or dusky in the brightly colored ones. Notes usually sharp, often richly melodious, in other cases harsh.

Genera about twenty, species one hundred, all American, some of the short-billed forms scarcely distinct from *Fringillidæ;* others are as closely related to *Sturnidæ* (Old World Starlings) and *Corvidæ*. There are three sub-families, of which *Agelæinæ* includes most of our species. *Icterinæ* includes *Icterus*, while *Scolecophagus* and *Quiscalus* belong to *Quiscalinæ.*

I. Tail feathers rigid, acute; middle toe and claw longer than tarsus; black and whitish (♂) or brownish, streaked (♀); bill short, finch-like. . . . . . DOLICHONYX, 1.

II. Feathers of crown bristle-tipped; tail short, its feathers acute; yellow below, a black breast patch; bill long. STURNELLA, 5.

III. Lateral claws elongated; black or brown, yellow on head and neck; length more than 8. . . XANTHOCEPHALUS, 4.

IV. With none of the above combinations of characters.

* Length at least more than 7.

† Bill horn-blue, very acute; black or olivaceous, with orange or yellow. . . . . . . ICTERUS, 6.

†† Bill blackish; plumage every where streaked; usually a rusty tinge on throat and bend of wing. ♀ of AGELÆUS, 3.

††† Bill jet black; plumage in ♂ black, in ♀ duller, streaky, or plain brown.

‡ Glossy black; bend of wing red, bordered by buffy and whitish. . . . . . ♂ of AGELÆUS, 3.

‡‡ Black; head and neck rich lustrous brown. ♂ of MOLOTHRUS, 2.

‡‡‡ Iridescent black throughout; wings scarcely longer than tail; length more than 10. . QUISCALUS, 8.

‡‡‡‡ Black, often obscured by brownish or rusty; no red or yellow; wings longer than tail; length 9 to 10. SCOLECOPHAGUS, 7.

** Length less than 7.

a. Dusky gray brown; bill blackish, shortened, finch-like. ♀ of MOLOTHRUS, 2.

aa. Black with chestnut or orange (♂), or else olive and yellowish (♀); bill acute, bluish or brown. . . ICTERUS, 6.

1. ***DOLICHONYX,*** Swainson. BOBOLINKS.

1. ***D. oryzivorus,*** (L.) Sw. BOBOLINK. REED BIRD. RICE BIRD. ♂ in Spring black, neck buffy, shoulders and rump ashy white, back streaky; ♀ and fall ♂ yellowish brown, streaked above,—dull yellow birds, resembling sparrows but known by the acute tail feathers; L. 7½; W. 4; T. 3. E. U. S., abundant in meadows northward, where, in the breeding season, it is our merriest and most delightful songster. Retiring southward in the fall, it fattens in the rice swamps and becomes a "game bird."

2. ***MOLOTHRUS,*** Swainson. COW BIRDS.

1. ***M. ater,*** (Bodd.) Gray. COW BIRD. ♂ iridescent black, head and neck glossy brown; ♀ much smaller,

dusky brown; L. (♂) 8; W. 4; T. 3. U. S., abundant; noted for its parasitic habits. [*M. pecoris* (Gmel.), Sw.]

3. AGELÆUS, Vieillot. RED-WING BLACK BIRDS.

1. ***A. phœniceus,*** (L.) V. RED-WINGED STARLING. SWAMP BLACK BIRD. ♂ glossy (not iridescent) black, lesser wing covers scarlet, with buffy and paler edgings; ♀ dusky, streaked; L. 9; W. 5; T. 4. U. S., every where abundant.

4. XANTHOCEPHALUS, Bonaparte. YELLOW-HEADED BLACK BIRDS.

1. ***X. xanthocephalus,*** (Bon.) YELLOW-HEADED BLACK BIRD. ♂ black with white wing patch; head and neck rich yellow; ♀ smaller, browner, with less yellow; L. 10; W. 5½; T. 4½. Southwestern, E. to L. Michigan.

5. STURNELLA, Vieillot. MEADOW LARKS.

1. ***S. magna,*** (L.) Sw. MEADOW LARK. Brownish and much streaked above; chiefly yellow below, a black crescent on breast. L. 10; W. 5; T. 3½. U. S.; very abundant. (*S. neglecta*, Aud., is the Western variety, Illinois S. and W., with "a much sweeter song," and some slight differences of plumage.)

6. ICTERUS, Brisson. AMERICAN ORIOLES.

1. ***I. galbula,*** (L.) Coues. BALTIMORE ORIOLE. GOLDEN ROBIN. FIRE BIRD. Black; bend of wing, rump, most tail feathers, and under parts from the breast orange of varying intensity; ♀ duller, olivaceous and yellow; L. 7¾; W. 3⅔; T. 3. E. U. S., abundant; noted for its elaborate hanging nest.

2. ***I. spurius,*** (L.) Bon. ORCHARD ORIOLE. ♂ black; rump, bend of wing and lower parts deep chestnut; ♀

yellowish olive, quite small; young yellow, with various black or chestnut traces; L. 7; W. 3½; T. 3. E. U. S., rather southerly.

7. SCOLECOPHAGUS, Swainson. Rusty Black Birds.

1. ***S. ferrugineus,*** (Gm.) Sw. Rusty Grackle. Rusty Black Bird. ♂ glossy black and rusty in autumn; ♀ dusky, lustreless; bill slender; L. 9½; W. 4¾; T. 4. E. U. S.

2. ***S. cyanocephalus,*** (Wagl.) Cab. Brewer's Black Bird. ♂ black with green lustre, head glossed with purple; ♀ dusky; L. 10; W. 5⅓; T. 4½. W., E. to Ills. and Wis.

8. QUISCALUS, Vieillot. Crow Black Birds.

1. ***Q. quiscula,*** (L.) Crow Black Bird. Purple Grackle. Iridescent black, lustre on head purplish, on body bronzy; L. 13; W. 5½; T. 5⅓. E. U. S., abundant.

FAMILY XXXV.—CORVIDÆ.

(*The Crows and Jays.*)

Primaries 10; first about half length of second; nostrils usually concealed by tufts of bristly feathers, which are branched to their tips. Bill long and strong, usually notched, commissure not angulated. Tarsus oscine, its sides undivided and separated from the scutella in front by a groove which is either naked or filled in with small scales. Voice usually harsh and unmusical.

Birds of large size, the largest of the *Oscines*, found almost every where. Genera about forty; species one hundred and seventy-five. Our two sub-families, *Corvinæ*, the Crows, and *Garrulinæ* the Jays, are usually readily distinguishable.

* Tail much shorter than the long, pointed wings. (*Corvinæ.*)

† Plumage glossy black. . . . . . . Corvus, 1.

** Tail longer than the short, rounded wings. (*Garrulinæ.*)

‡ Conspicuously crested; chiefly blue; quills black-barred. Cyanocitta, 3.

‡‡ Iridescent black and white; tail much longer than wings. Pica, 2.

‡‡‡ Chiefly gray, no blue; tail scarcely longer than wings. Perisoreus, 4.

1. CORVUS, Linnæus. RAVENS.

1. ***C. corax,*** L. Raven. Feathers of throat stiffened, elongated, narrow and lanceolate, their outlines very distinct; L. 25; W. 17; T. 10. N. Am., chiefly north and westward; rare E. of the Mississippi. Also European. (*C. carnivorus*, Bartr.)

2. ***C. americanus,*** Aud. Crow. Feathers of throat short, broad, obtuse, with their webs blended; gloss of plumage purplish violet; head and neck scarcely lustrous; L. 20; W. 13; T. 8. E. N. Am., chiefly eastward; abundant. (*C. frugivorus*, Bartr.)

3. ***C. ossifragus,*** Wilson. Fish Crow. Gloss of plumage green and violet, evident on head and neck; L. 16; W. 11; T. 7. New England to Florida, chiefly southern, and found only along the coast. (*C. maritimus*, Bartr.)

2. PICA, Cuvier. MAGPIES.

1. ***P. pica*** (L.) var. ***hudsonica,*** (Sab.) Coues. Magpie. Lustrous black; belly, shoulders, and wing-edgings white; L. 19; W. 8½; T. 13, much graduated. Western, E. to L. Michigan.

3. CYANOCITTA, Strickland. BLUE JAYS.

1. ***C. cristata***, (L.) Str. Blue Jay. Blue; collar and frontlet black; grayish below; wings and tail clear

blue, barred; outer tail feathers and secondaries tipped with white; L. 12; W. 5½; T. 5¾. N.E. Am., abundant.

4. *PERISOREUS,* Bonaparte. Gray Jays.

1. ***P. canadensis,*** (L.) Bon. Canada Jay. Whiskey Jack. Ashy gray with blackish and whitish markings; L. 10¾; W. 5¾; T. 6. Northern, S. to New England in Winter.

FAMILY XXXVI.—TYRANNIDÆ.

(*The Flycatchers.*)

Primaries 10; first more than ¾ length of second, and one or more of them often attenuate; bill broad, triangular, depressed, abruptly hooked and notched at tip, with long rictal bristles; commissure nearly straight; nostrils small, usually partly concealed. Tarsus "clamatorial," the scutella extending around its back. Feet small, for perching. Mouth capacious; notes simple, often pleasant; changes of plumage slight; ours mostly olivaceous.

A large family of eighty genera, and more than three hundred species; all American and mostly tropical. All are insectivorous, most of them pre-eminently so; they are, therefore, in our latitude, migratory.

* First primaries evidently attenuate; crown with concealed bright red or yellow crest (in adult).

† Tail widely forked, about twice as long as wings. Milvulus, 1.

†† Tail nearly even, shorter than wings. . . Tyrannus, 2.

** First primaries not obviously attenuate; crown plain, sometimes crested.

‡ Wings edged with chestnut, not much longer than tail; length 8 or more. . . . . . . Myiarchus, 3.

‡‡ Wings not chestnut-edged, not much longer than tail; tarsus longer than middle toe and claw; bill black; length 6½ to 7½. . . . . Sayornis, 4.

‡‡‡ Wings longer than tail; tarsus shorter than middle toe and claw; bill not all black; length 6 or more. CONTOPUS, 5.

‡‡‡‡ Wings not much longer than tail; middle toe and claw not longer than tarsus; bill mostly pale below; length 6¼ or less. . . . . EMPIDONAX, 6.

1. *MILVULUS,* Swainson. FORK-TAILED FLYCATCHERS.

1. ***M. forficatus,*** (Gm.) Sw. SCISSOR-TAIL. Ashy, tail, shoulders, sides, etc., with much red; L. 13; W. 5; T. 8. S. W., N. to Kansas, straying to New Jersey.

2. ***M. tyrannus,*** (L.) Bon. FORK-TAILED FLYCATCHER. Larger, no red, tail still more elongate. Tropical, straying to N. J. and La.

2. *TYRANNUS,* Cuvier. KING BIRDS.

1. ***T. tyrannus,*** (L.) KING BIRD. BEE MARTIN. Blackish ash, white below; tail black, white-tipped; L. 8½; W. 4⅔; T. 3½. U. S., chiefly eastward; abundant. "Destroys a thousand noxious insects for every bee it eats!" (*Coues.*)

2. ***T. verticalis,*** Say. ARKANSAS FLYCATCHER. Belly yellow; tail white-edged. Western, straying to N. J.

3. *MYIARCHUS,* Cabanis. CRESTED FLYCATCHERS.

1. ***M. crinitus,*** (L.) Cab. GREAT CRESTED FLYCATCHER. Scarcely crested; olivaceous, yellow below, with bright chestnut on wings and tail; L. 8¾; W. 4; T. 4. E. U. S., chiefly southerly, N. to N. Wis. A handsome bird, "noted for the habitual use of cast-off snake skins in the structure of its nest."

4. *SAYORNIS,* Bonaparte. PEWEES.

1. ***S. fuscus,*** (Gm.) Baird. PEWEE. PHŒBE. PEWIT. Olive brown, head and tail darker; yellow below, more

or less; L. 7; W. $3\frac{1}{3}$; T. $3\frac{1}{4}$. E. U. S., abundant; known by its black bill.

5. *CONTOPUS*, Cabanis. Wood Pewees.

1. ***C. borealis,*** (Sw.) Baird. Olive-Sided Flycatcher. Rictal bristles short, one-fourth length of bill; tuft of white cottony feathers on sides very conspicuous; middle line of belly distinctly and abruptly white; otherwise olive brown, paler or yellowish below; L. $7\frac{1}{2}$; W. $4\frac{1}{3}$; T. 3. Northern, S. to N. Y.

2. ***C. virens,*** (L.) Cab. Wood Pewee. Rictal bristles half length of bill; cottony tuft inconspicuous; wing bands whitish or rusty; olive brown above; pale or yellowish below; lower mandible usually pale; L. $6\frac{1}{4}$; W. $3\frac{1}{2}$; T. 3. U. S., very abundant.

3. ***C. richardsoni,*** (Sw.) Bd. Western Wood Pewee. Darker; bill dusky below. N. W., E. to Wis.; nearly like the preceding, but the notes and nesting different.

6. *EMPIDONAX*, Cabanis. Least Flycatchers.

1. ***E. acadicus,*** (Gm.) Baird. Small Green-Crested Flycatcher. Clear olive green, wing bands buffy; whitish becoming yellowish below; yellowish ring about eyes; bill pale below; primaries nearly an inch longer than secondaries; 2d, 3d and 4th primaries nearly equal, and much longer than 1st and 5th; 1st much longer than 6th; L. 6; W. 3; T. $2\frac{3}{4}$; Ts. $\frac{2}{3}$; Tcl. $\frac{1}{2}$. E. U. S., frequent.

2. ***E. traillii,*** (Aud.) Baird. Traill's Flycatcher. Olive brown, duller than preceding; bill pale below; 5th primary about as long as 4th, 1st not much longer than 6th; middle toe $\frac{2}{3}$ length of tarsus; longest primary $\frac{2}{3}$ inch longer than secondaries; L. $5\frac{3}{4}$; W. $2\frac{3}{4}$; T. $2\frac{1}{2}$; Ts. $\frac{2}{3}$; Tcl. $\frac{3}{5}$. U. S.

3. ***E. minimus,*** Baird. LEAST FLYCATCHER. Olive gray; bill blackish below; wings like preceding, but longest primary but ½ inch longer than secondaries; middle toe half as long as tarsus; bill less than ½ inch; L. 5; W. 2½; T. 2¼. E. N. Am., abundant.

4. ***E. flaviventris,*** Baird. YELLOW-BELLIED FLYCATCHER. Clear olive green; yellow below, becoming bright yellow (not merely yellowish as in the others) on the belly; first primary about equal to sixth; feet as in *acadicus;* bill yellow below; L. 5¼; W. 2¾; T. 2½. E. U. S.

ORDER H.—PICARIÆ.

(Picarian Birds.)

Hind toe small, sometimes wanting, occasionally elevated; its claw shorter than that of middle toe (with rare exceptions); 3d and 4th toes often with less than the normal number of joints; 2d and 4th toes sometimes versatile. Wing coverts larger and in more numerous series than in the *Passeres.* Primaries 10, first rarely short; tail feathers 10 (8 to 12). Musical apparatus imperfect. Sternum non-passerine. Tarsus never oscine. Nature altricial. A highly diversified group, the members of which have little in common except their want of resemblance to other birds.

FAMILY XXXVII.—CAPRIMULGIDÆ.

(The Goatsuckers.)

Bill very short, "fissirostral," the gape exceedingly deep and wide, reaching to below the eyes, and usually with prominent rictal bristles. Wings long and pointed; secondaries lengthened. Plumage long and loose, owl-like. Tail feathers 10. Feet very small; tarsus short, partly feathered; toes slightly webbed at base, the hind toe somewhat elevated. Genera fourteen; species one hundred or more, widely diffused; chiefly insectivorous.

* Tail rounded; rictal bristles very long. . CAPRIMULGUS, 1.

** Tail forked; rictal bristles inconspicuous. . CHORDEILES, 2.

1. *CAPRIMULGUS,* (L.) WHIPPOORWILLS.

1. ***C. vociferus,*** (Wils.) WHIPPOORWILL. NIGHT JAR. Grayish, much variegated; pectoral bar and ends of outer tail feathers white (♂) or tawny (♀); rictal bristles unbranched; L. 10; W. 6; T. 5. E. U. S., abundant, nocturnal; noted for its "solemn and prophetic" cry.

2. ***C. carolinensis,*** (Gm.) CHUCKWILL'S WIDOW. More reddish; rictal bristles with lateral filaments; L. 12; W. 9; T. 6½. Southern, N. to Ills. (*Nelson.*)

2. *CHORDEILES,* Swainson. NIGHT HAWKS.

1. ***C. popetue,*** (V.) Bd. NIGHT HAWK. BULL BAT. Blackish, variegated; a large wing spot, bar across tail, and V-shaped blotch on throat—white in ♂, tawny or obscure in ♀; L. 9½; W. 8; T. 5. U. S.; abundant.

FAMILY XXXVIII.—CYPSELIDÆ.

(The Swifts.)

Bill fissirostral, as in *Caprimulgidæ* and *Hirundinidæ.* Wings very long, thin and pointed; secondaries very short. Feet small, weak; hind toe often elevated or otherwise turned; toes completely cleft. No rictal bristles. Tail feathers 10; plumage compact. In most species the salivary glands are highly developed, and their secretion is used as a glue in the construction of the nest; species of *Collocalia* thus form the edible bird's nest. Small birds of the warmer parts of the world, bearing a superficial resemblance to Swallows, but structurally very different, being closely related to the Humming Birds. Genera six or eight; species about fifty.

* Tarsus bare, longer than middle toe; tail feathers with the shafts spinous, projecting beyond the plumage.
CHÆTURA, 1.

1. CHÆTURA, Stephens. CHIMNEY SWALLOWS.

1. ***C. pelasgica,*** (L.) Baird. CHIMNEY SWIFT. Sooty brown; throat paler; L. 5¼; W. 5; T. 2. E. U. S., abundant.

FAMILY XXXIX.—TROCHILIDÆ.

(*The Humming Birds.*)

Bill subulate, usually longer than the head, straight or curved; tongue capable of great protrusion. Wings long and pointed, the secondaries short, only six in number; tail of ten feathers. Feet very small, with sharp claws. Smallest of all birds and among the most brilliantly colored. Genera seventy-five; species three hundred or more, thus forming one of the largest families in Ornithology. All are American, and most of them tropical, but our common species ranges far into British America.

* First primary not attenuate, bowed or curved inwards.
TROCHILUS, 1.

1. TROCHILUS, Linnæus. RUBY-THROATED HUMMING BIRDS.

1. ***T. colubris,*** L. RUBY-THROATED HUMMING BIRD. ♂ metallic green above; a ruby-red gorget; tail deeply forked, uniform purplish; ♀ without red, the tail vari-

egated; L. $3\frac{1}{4}$; W. $1\frac{2}{3}$; T. $1\frac{1}{4}$; B. $\frac{2}{3}$. E. N. Am.; abundant in summer.

FAMILY XL.—ALCEDINIDÆ.

(The Kingfishers.)

Head large; bill long, straight and strong, usually longer than head; gape deep, tomia not serrate. Wings long; tail short. Legs quite small; feet syndactyle—the outer and middle toes united to their middle, a continuous sole beneath; tibia naked below. Tail feathers twelve. Species about one hundred, chiefly of the tropical parts of the Old World and Australia. Many of them feed upon fishes, and nearly all are remarkable for their brilliant coloration.

* Head crested. . . . . Ceryle, 1.

1. CERYLE, Boie. Kingfishers.

> *Ispida*, Swainson.

1. ***C. alcyon,*** (L.) Boie. Belted Kingfisher. Ashy blue above, a bluish band across breast; white below; ♀ with sides and band across belly chestnut; tail barred with white; L. 13; W. 6; T. $3\frac{1}{2}$; B. 2, or more. N. Am.; every where.

FAMILY XLI.—CUCULIDÆ.

(The Cuckoos.)

Bill compressed, lengthened, decurved; usually without rictal bristles or nasal tufts. Tail long and soft, of eight to twelve feathers. Tongue not extensible. Feet zygodactyle, by reversion of fourth toe. Species about two hundred, in various parts of the world.

* Plumage lustrous olive gray or drab; arboreal. Coccygus, 1.

1. ***COCCYGUS,*** Vieillot. AMERICAN CUCKOOS.

1. ***C. americanus,*** (L.) Bon. YELLOW-BILLED CUCKOO. Bill yellow below; wings with much cinnamon red; middle tail feathers like the back; outer ones black with broad white tips; L. 12; W. 5½; T. 6. U. S.

2. ***C. erythrophthalmus,*** (Wils.) Baird. BLACK-BILLED CUCKOO. Bill chiefly black; wings with little or no reddish; tail feathers all brownish, obscurely whitish at tips; L. 11½; W. 5; T. 6¼. E. U. S.

FAMILY XLII. — PICIDÆ.

(*The Woodpeckers.*)

Bill stout, usually straight, with the tip truncate or acute, fitted for hammering or boring into wood. Tongue long, flattish, barbed, capable of great protrusion, adapted for securing insects (except in *Sphyrapicus*); hyoid apparatus peculiar, its horns generally quite long, curving around the skull behind. Feet zygodactyle, outer toe permanently reversed; hind toe present (except in *Picoides*); claws compressed, sharp and strong. Tail feathers 12, rigid and acuminate, outer part short, concealed; tail never forked; nasal tufts usually present.

Chiefly arboreal; all (except *Sphyrapicus*, which is truly a "Sap-Sucker,") are pre-eminently insectivorous and hence they are of the greatest service to the farmer. Voice loud and often harsh. Colors generally bright, the male at least having almost always red on the head; sexes usually slightly different. Species two hundred and fifty, abundant almost every where.

*Conspicuously crested; length 18 or more.
— Bill dark. . . . . . . HYLOTOMUS, 1.
— Bill and nasal feathers pale. . CAMPEPHILUS, 2.
** Not crested; toes 3 only, hallux wanting. . PICOIDES, 4.
*** Not crested; toes 4, length less than 14.

† Tongue obtuse, brushy; ridges on upper mandible running into the tomia; belly with some yellow. Sphyrapicus, 5.

†† Tongue acute, barbed; ridges on sides of upper mandible reaching the tip; no yellow; quills (in ours) with round white spots. . . . . Picus, 3.

††† Tongue acute, barbed; ridges on sides of upper mandible wanting or indistinct.

‡ Back barred.

a. Belly with round black spots; feathers of wings and tail yellow or orange beneath. . . Colaptes, 8.

aa. Belly unspotted, tinged with red or yellow; no yellow on quills. . . . . Centurus, 6.

‡‡ Back not barred; body lustrous blue-black; rump, secondaries, and under parts white; head and neck red in adults, grayish in young. . . . Melanerpes, 7.

1. HYLOTOMUS, Baird. Black Woodcocks.

1. ***H. pileatus,*** (L.) Baird. Pileated Woodpecker. Logcock. Black; white streak down neck; crest and cheek patch scarlet in ♂; cheeks and front of crest black in ♀, L. 18; W. 9½; T. 7. N. Am.; in heavy timber.

2. CAMPEPHILUS, Gray. Ivory-Billed Woodpeckers.

1. ***C. principalis,*** (L.) Gray. Great Ivory-Billed Woodpecker. Black with white markings; crest scarlet in ♂, black in ♀; L. 21; W. 11; T. 8. Southern, N. to S. Ills.

3. PICUS, Linnæus. Spotted Woodpeckers.

1. ***P. borealis,*** Vieill. Red-Cockaded Woodpecker. Black and white, spotted and crosswise banded, but not streaked; a red line on each side of head in ♂; L. 8½; W. 4½; T. 3½. Southern States in swamps, N. to Penn.

2. ***P. villosus,*** L. Hairy Woodpecker. Big Sap-Sucker. Spotted and lengthwise streaked, but not

banded; back black with a long white stripe; outer tail feathers wholly white; L. 9; W. 5; T. $3\frac{1}{2}$; a scarlet nuchal band in ♂ only. U. S.; every where.

3. ***P. pubescens,*** L. Downy Woodpecker. Little Sap-Sucker. Much smaller; outer tail feathers black and white, barred, otherwise precisely like the other; L. $6\frac{1}{2}$; W. $3\frac{3}{4}$; T. $2\frac{3}{4}$. U. S.; every where.

4. *PICOIDES,* Lacepede. Three-Toed Woodpeckers.

1. ***P. arcticus,*** (Sw.) Gray. Black-Backed Woodpecker. Black and white; crown yellow in ♂, plain in ♀; back uniform black; L. 9; W. 5; T. $3\frac{2}{3}$. Northern, S. to U. S. in winter.

2. ***P. americanus,*** Brehm. Banded Three-Toed Woodpecker. Back with a white lengthwise stripe; otherwise as above; L. 8; W. $4\frac{1}{2}$; T. $3\frac{1}{2}$. Arctic, S. in winter to New England.

5. *SPHYRAPICUS,* Baird. Sap-Sucking Woodpeckers.

1. ***S. varius,*** (L.) Baird. Yellow-Bellied Woodpecker. Black and white above; black on breast; chiefly yellowish below; white wing patch; crown red in adult, chin scarlet in ♂; L. $8\frac{1}{4}$; W. $4\frac{3}{4}$; T. $3\frac{1}{3}$. U. S., abundant.

6. *CENTURUS,* Swainson. Red-Bellied Woodpeckers.

1. ***C. carolinus,*** (L.) Bon. Red-Bellied Woodpecker. Grayish, much barred above with black and white; crown and nape crimson in ♂, crown ashy in ♀, belly reddish-tinged; L. $9\frac{3}{4}$; W. 5; T. $3\frac{1}{2}$. E. U. S., rather southerly; N. to N. Wis.

7. *MELANERPES,* Swainson. Red-Headed Woodpeckers.

1. ***M. erythrocephalus,*** (L.) Sw. Red-Headed Wood-

PECKER. L. 9; W. 5½; T. 3½. U. S., E. of the Rocky Mts.; abundant.

8. COLAPTES, Swainson. FLICKERS.

1. ***C. auratus,*** (L.) Sw. GOLDEN-WINGED WOODPECKER. HIGH-HOLER. YARUP. Head ashy, with red nuchal crescent; back olivaceous, barred with black; rump white; below pinkish brown shading into yellowish, a black crescent on breast and numerous round black spots; shafts and under surfaces of quills golden yellow; ♂ with a black maxillary patch; L. 12½; W. 6; T. 4½. E. U. S., abundant.

Var. ***mexicanus,*** (Sw.) Snow. RED-SHAFTED FLICKER. Quills with orange red instead of golden; maxillary patches in ♂ red instead of black; no nuchal crescent; no yellowish on belly. Western, E. to Kas., etc. Runs into the preceding, through *C. hybridus.* Baird.

ORDER I.—PSITTACI.

(*The Parrots.*)

Bill enormously thick, cered at base and strongly hooked. Feet zygodactyle by reversion of outer toe, tarsus reticulate. Tongue short, fleshy; upper jaw unusually movable. Altricial. Plumage often brilliant. In all warm regions; species three hundred and fifty-four, nearly half of which are American.

FAMILY XLIII.—ARIDÆ.

(*The Macaws.*)

Parrots with the head not crested, and the tail long, wedge-shaped or graduated. (*Baird.*)

* Culmen rounded; face entirely feathered except a curve about the eye; tail shorter than wings. . . CONURUS, 1.

1. **CONURUS,** Kuhl. PARROQUETS.

1. ***C. carolinensis,*** (L.) Kuhl. CAROLINA PARROQUET. Green; head and neck yellow; face red; wings with blue and yellow; bill white; L. 13; W. 7½; T. 6. Southwestern, formerly N. to the Great Lakes; now nearly exterminated.

ORDER J.—RAPTORES.

(*The Birds of Prey.*)

Bill powerful, cered at base, strongly hooked at the end. Feet never zygodactyle; fourth toe sometimes versatile; claws long and sharp; hind toe well developed, rarely elevated; tibia, and often tarsus, feathered. Primaries 10; tail feathers 12 (with rare exceptions). Altricial, but young downy at birth. Carnivorous birds, generally of large size and great strength, found in every part of the world.

FAMILY XLIV.—STRIGIDÆ.

(*The Owls.*)

Head very large, shortened lengthwise and greatly expanded laterally; the eyes directed forwards and partly surrounded by a disk of radiating feathers of peculiar texture; loral feathers antrorse, long and dense; feathers on the sides of forehead often elongated into ear-like tufts. Plumage very soft and lax, rendering the flight almost noiseless; its colors blended and mottled so as to render minute description difficult. External ear very large, often provided with a movable flap. Outer toe versatile; claws very sharp, long and strong. Eggs nearly spherical, pure white. Chiefly nocturnal. Sexes colored alike, ♀ usually the larger. Owls are found in every part of the globe, and most of the species have a wide range. Their habits are so well known that I need not dwell upon them here. Genera about forty; species one hundred and fifty.

* Tarsus naked or scant-feathered, facial disk perfect; no ear-tufts; middle claw pectinate; iris black. . ALUCO, 1.

** Tarsus fully feathered.

† Head with evident "ear-tufts;" iris yellow.

‡ Tail about $\frac{2}{3}$ of wing; bill blackish; length more than 18. BUBO, 6.

‡‡ Tail about half length of wing; length less than 18.

a. Bill pale; length less than 12. . . . SCOPS, 5.

aa. Bill dark; length more than 12. . . . ASIO, 2.

†† Head without evident "ear-tufts."

b. Tail about $\frac{1}{2}$ length of wing; iris yellow; length less than 12. . . . . NYCTALE, 4.

bb. Tail about $\frac{2}{3}$ of wing; length 18 or more.

c. Pure white, with dark markings; toes concealed by long feathers; facial disk incomplete; bill black; iris yellow. NYCTEA, 7.

cc. Grayish, much barred; facial disk complete; bill yellow; iris black or yellow. . . . . STRIX, 3.

bbb. Tail about $\frac{3}{4}$ of wing; bill yellow; iris yellow; length about 16. . . . . SURNIA, 8.

*** Tarsus long, sparsely bristly; facial disk imperfect; middle claw simple. . . . . SPEOTYTO, 9.

1. ALUCO, Fleming. BARN OWLS.

1. ***A. flammeus,*** (L.) var. ***pratincola,*** (Bon.) Ridg. BARN OWL. Face elongated; reddish or tawny, much variegated; L. 17; W. 13; T. $5\frac{1}{2}$. U. S., rather southerly.

2. ASIO, Brisson. EARED OWLS.

(*Otus*, Cuvier.)

1. ***A. otus,*** (L.) Less. LONG-EARED OWL. Ear tufts well developed, of 8 to 12 feathers; outer primary

only emarginate; much variegated; L. 15; W. 12; T. 6. U. S.

2. ***A. accipitrinus,*** (Pallas.) Macgil. Short-Eared Owl. Ear tufts small and inconspicuous; two outer primaries emarginate; L. 15; W. 12; T. 6. U. S. and Europe. (*Brachyotus palustris*, Auct.)

3. ***STRIX,*** Linnæus. Barred Owls.

*Iris black; 5 outer primaries emarginate. (*Syrnium.*)

1. ***S. nebulosa,*** Forst. Barred Owl. Toes not concealed; olive brown, barred with white above; breast barred; belly streaked; L. 18; W. 14; T. 9. E. N. Am., common.

**Iris yellow; 6 outer primaries emarginate. (*Scotiaptex.*)

2. ***S. cinerea,*** Gmel. Great Gray Owl. Toes concealed by long feathers; cinereous brown above, waved with white; breast streaked, belly barred; largest of all our owls; L. 30; W. 18; T. 12. Northern, S. in winter to N. States.

4. ***NYCTALE,*** Brehm. Sparrow Owls.

1. ***N. tengmalmii,*** Gm. var. ***richardsonii,*** (Bon.) Ridg. Tengmalm's Owl. Nostrils sunken, elongated, opening laterally; tail more than half wing; general color chocolate brown, variegated; L. 10; W. $7\frac{1}{4}$; T. $4\frac{1}{2}$. Northern, S. to N. U. S.

2. ***N. acadica,*** (Gm.) Bon. Saw-Whet Owl. Nostrils prominent, nearly circular, opening anteriorly; L. 8; W. $5\frac{3}{4}$; T. $2\frac{3}{4}$. U. S., rather northerly.

5. ***SCOPS,*** Savigny. Screech Owls.

1. ***S. asio,*** (L.) Bon. Screech Owl. Red Owl. Grayish, speckled and barred, or else with the grayish replaced by bright reddish; these two different styles of

plumage bearing no relation to age, sex or season; L. 10; W. 7; T. 3½. U. S., abundant.

6. **BUBO,** Dumeril. GREAT HORNED OWLS.

1. ***B. virginianus,*** (Gm.) Bon. GREAT HORNED OWL. Black, gray and buffy, variously mottled and barred; usually a whitish half-collar; ear tufts large, their feathers mostly black; L. 22; W. 16; T. 10. U. S., abundant; one of the strongest and most untamable of the Owls.

7. **NYCTEA,** Stephens. GREAT SNOW OWLS.

1. ***N. scandiaca,*** (L.) Newt. SNOWY OWL. Pure white, more or less barred with blackish; L. 23; W. 17; T. 10. Northern, S. in Winter; one of the handsomest of Owls. (*N. nivea*, Auct.)

8. **SURNIA,** Dumeril. HAWK OWLS.

1. ***S. funerea,*** (L.) Richardson & Swainson. HAWK OWL. DAY OWL. Brown, much speckled and barred; L. 16; W. 9; T. 7. Northern, S. to Wis. and Mass.

9. **SPEOTYTO,** Gloger. BURROWING OWLS.

1. ***S. cunicularia,*** (Mol.) var. ***hypogœa,*** (Bon.) Coues. BURROWING OWL. Brownish, much spotted and variegated. L. 10; W. 7½; T. 4. Fla. and Western Plains, living in the holes of prairie dogs.

FAMILY XLV.—FALCONIDÆ.

(*The Falcons.*)

Eyes lateral, eyelids provided with lashes, usually a projecting bony eyebrow; no complete facial disk. Toes always naked, and usually tarsus also; hind toe not elevated. Head fully feathered (except in the Old World

Vulturinæ), no ear tufts. Base of stout, strongly hooked bill, not hidden by feathers. Claws very strong and sharp. Plumage usually of blended colors, barred or streaked; changes considerable; ♀ usually the larger. Genera fifty, species three hundred, abounding every where. Their habits are too well known to require description here.

I. Tarsus feathered to the toes.

a. Tarsus entirely feathered; tail 12 or more. . AQUILA, 12.

aa. Tarsus with a narrow unfeathered strip behind; tail less than 12. . . . . . . ARCHIBUTEO, 11.

II. Tarsus reticulate all around.

b. Upper mandible toothed; under notched; nostrils circular. FALCO, 1.

bb. Tail widely forked; outer feather twice as long as middle ones; colors black and white. . . ELANOIDES, 3.

bbb. Claws all of same length, rounded beneath; tibial feathers close; plumage compact, without after shafts. PANDION, 2.

bbbb. Tail emarginate, and outer feather not longer than middle; head and tail white in adult. . . . ELANUS, 5.

III. Tarsus scutellate in front only (occasionally "booted.")

c. Toes not webbed at all; neck feathers lanceolate, white in adult. . . . . HALIAETUS, 13.

cc. Toes somewhat webbed at base.

d. Nostrils circular; tail less than ⅔ length of wing. ICTINIA, 4.

dd. Nostrils oval; tail more than ⅔ length of wing.

e. Tarsus feathered about half way down in front, the feathers scarcely separated behind. . ASTUR, 7.

ee. Tarsus feathered less than one-third down in front, the feathers widely separated behind. . ACCIPITER, 8.

IV. Tarsus scutellate in front and behind.

f. Face with a slight ruff; tarsus twice length of middle toe; upper tail coverts white. . . . . CIRCUS, 6.

ff. No ruff; 3 or 4 outer primaries emarginate; rump not white. BUTEO, 10.

fff. No ruff; 4 primaries emarginate; tail coverts white; tail black. . . . . ASTURINA, 9.

1. ***FALCO,*** Linnæus. FALCONS.

* First primary only emarginate on inner web; 2d longest, 1st shorter than 4th; tarsal plates small; sexes colored alike.

† Tarsus not longer than middle toe, scarcely feathered below joint. (*Falco.*)

1. ***F. peregrinus,*** Tunst. PEREGRINE FALCON. DUCK HAWK. Blackish ash with paler waves; below whitish, barred; black cheek patches; L. 16; W. 13; T. 7. U. S., not common.

†† Tarsus longer than middle toe and claw, feathered for some distance. (*Hierofalco,* Cuv.)

2. ***F. sacer,*** Forst. GYRFALCON. Tarsus feathered half way down, with only a bare strip behind; white or ashy with dark markings; L. 24; W. 16; T. 10. Northern regions of both continents; var. *islandicus,* S. to U. S. in winter. (*F. gyrfalco,* L.)

3. ***F. mexicanus,*** Licht. LANIER FALCON. Tarsus feathered $\frac{1}{3}$ way down; general color brown; L. 18; W. 14; T. 8. S. W., E. to Ills.

** Two primaries emarginate; tarsal plates enlarged in front, appearing like scutella.

‡ Tarsus about equal to middle toe; basal joints of toes without transverse scutella. (*Æsalon,* Kaup.)

4. ***F. columbarius,*** L. PIGEON HAWK. AMERICAN MERLIN. Ashy blue or blackish above, variegated below; L. 13; W. 8; T. 5. U. S.

‡‡ Tarsus longer than middle toe; basal joints of toes with transverse scutella. (*Tinnunculus,* Vieill.)

5. ***F. sparverius,*** L. SPARROW HAWK. RUSTY-CROWNED FALCON. Back tawny; wings bluish and black; seven black blotches about head; tail chestnut,

with a broad black band in ♂, and a narrow terminal one of white; below white or tawny; L. 11; W. 7; T. 5. U. S., abundant. (Female different, more streaky.)

2. *PANDION,* Savigny. Ospreys.

1. ***P. haliaetus,*** (L.) Savigny. Osprey. Fish Hawk. Dark brown; head, neck and under parts mostly white; feet very large; L. 24; W. 20; T. 10. U. S.; feeds on fishes.

3. *ELANOIDES,* Vieill. Swallow-tailed Kites.

1. ***E. forficatus,*** (L.) Cs. Swallow-Tailed Kite. Lustrous black; head, neck and lower parts white; W. 17; T. 14. Southern, N. to Penn. and Minn.

4. *ICTINIA,* Vieillot. Blue Kites.

1. ***I. subcœrulea,*** (Bart.) Coues. Mississippi Kite. Chiefly lead blue, wings with chestnut; L. 15; W. 12; T. 6½. Southern, N. to Penn. and Wis. (*I. mississippiensis*, Auct.)

5. *ELANUS,* Savigny. White-Tailed Kites.

1. ***E. glaucus,*** (Bartr.) Coues. Black-Shouldered Kite. L. 17. Southern, N. to S. Ills. (*E. leucurus*, Auct.)

6. *CIRCUS,* Lacepede. Marsh Harriers.

1. ***C. cyaneus*** (L.) var. ***hudsonius,*** (L.) Coues. Marsh Harrier. Pale bluish or brown; rump and under parts whitish; L. 18; W. 15; T. 9. N. Am., abundant.

7. *ASTUR,* Lacepede. Goshawks.

1. ***A. atricapillus,*** (Wils.) Bp. Goshawk. Slate blue with white superciliary stripe; tail with four dark bars; L. 24; W. 14; T. 11. Northern, S. to U. S. in winter.

8. *ACCIPITER,* Brisson. HAWKS.

= *Nisus*, Cuvier.

1. ***A. fuscus,*** (Gm.) Bon. SHARP-SHINNED HAWK. "PIGEON HAWK." Bare portion of tarsus in front, longer than middle toe; tarsus "booted" in ♂; general color dark brown; L. 12; W. 7; T. 6. U. S., abundant.

2. ***A. cooperi,*** Bon. CHICKEN HAWK. Bare tarsus shorter than middle toe; L. 18; W. 10; T. 8. N. Am.

9. *ASTURINA,* Vieillot. GRAY HAWKS.

1. ***A. nitida,*** (Lath.) var. ***plagiata,*** (Schl.) Coues. GRAY HAWK. L. 18; W. 10; T. 7½. Mexican, straying to S. Ills.

10. *BUTEO,* Cuvier. BUZZARDS.

* 4 outer primaries emarginate on inner web. (*Buteo.*)

1. ***B. borealis,*** (Gm.) Vieill. HEN HAWK. RED-TAILED BUZZARD. Dark brown; much barred and streaked; tail bright chestnut red above; L. 23; W. 15½; T. 8½. U. S., common.

2. ***B. lineatus,*** (Gm.) Jard. RED-SHOULDERED BUZZARD. Dark reddish brown, variegated; bend of wing orange brown; L. 22; W. 14; T. 9. Smaller than the preceding, although nearly as long. E. N. Am., abundant.

** 3 outer primaries emarginate on inner web. (*Craxirex*, Gould.)

3. ***B. swainsoni,*** Bon. SWAINSON'S BUZZARD. Gray, variously streaked, usually a dark area on throat and breast; tail with six or more narrow dark bars; variable; L. 20; W. 16; T. 8½. Western; E. to Ind. and Mass.

4. ***B. pennsylvanicus,*** (Wils.) Bon. BROAD-WINGED HAWK. Brown above, whitish or fulvous below, variously streaked and barred; conspicuous dark cheek patches; tail with broad dark bands alternating with narrower

pale ones, white-tipped; L. 18; W. 11; T. 7. E. U. S.; a stout, handsome, though small hawk.

11. ARCHIBUTEO, Brehm. SQUIRREL HAWKS.

1. ***A. lagopus,*** (Brunn.), var. ***sancti-johannis,*** (Gm.) Ridg. ROUGH-LEGGED HAWK. BLACK HAWK. Chiefly whitish but sometimes entirely black; L. 24; W. 18; T. 10. N. Am.

12. AQUILA, Möhring. GOLDEN EAGLES.

1. ***A. chrysaetus,*** (L.) GOLDEN EAGLE. Glossy purplish brown; head and neck golden brown; quills blackish; L. 36; W. 25; T. 16. N. Am., chiefly northerly.

13. HALIAETUS, Savigny. BALD EAGLES.

1. ***H. leucocephalus,*** (L.) Savigny. BALD EAGLE. Dark brown; head, neck and tail white (after the third year); L. 36; W. 25; T. 14. N. Am., every where; feeds on fishes. "A piratical parasite of the Osprey, otherwise notorious as the emblem of the Republic." (*Coues.*)

FAMILY XLVI.—CATHARTIDÆ.

(*The New World Vultures.*)

Head and part of neck bare. Eyes lateral, not overhung; ears small. Bill lengthened, weak and but little hooked; nostrils perforate. Wings very long and strong, giving a strength and grace of flight scarcely excelled. Hind toe short, and elevated; front toes long, somewhat webbed, with rather weak and straightish claws. Large turkey-like raptores, without the strength and spirit of the hawks and owls; "voracious and indiscriminate gormandizers of carrion and animal refuse of all sorts, hence efficient and almost indispensable scavengers in the warm countries where they abound." (*Coues.*)

Two species, the Condor and the California Vulture, are among the largest birds of flight in the world. All are American, the Old World Vultures (*Vulturinæ*) being Vulture-like hawks. Genera five; species six or eight.

* Wings very long, primaries reaching to end of tail or farther; skin of neck not corrugated; a tuft of bristles in front of eye. . . . . CATHARTES, 1.

** Wings short, scarcely reaching middle of tail; skin of neck corrugated; no bristles in front of eye. . CATHARISTA, 2.

1. **CATHARTES**, Illiger. TURKEY BUZZARDS.

1. ***C. aura,*** (L.) Ill. TURKEY BUZZARD. Black, lustrous above; skin of head and neck red; L. 30; W. 22; T. 12. N. Am., abundant, southward.

2. **CATHARISTA,** Vieillot. CARRION CROWS.

1. ***C. atrata,*** (Bartr.) Gray. CARRION CROW. Uniform dull black; L. 24; W. 17; T. 8. N. C. to Mexico; rarely straying northward.

ORDER K.—COLUMBÆ.

(*The Doves.*)

Bill straight, compressed, the horny tip separated by a constriction from the soft part. Nostrils opening beneath a soft, tumid membrane. Frontal feathers sweeping in a strongly convex outline across base of upper mandible; tomiæ meeting. Hind toe on a level with the rest (except in *Starnœnas*, etc.), the others usually not webbed. Tarsus mostly scutellate in front, elsewhere reticulate, the plates soft. Head small.

Plumage soft, compact, the feathers very loosely inserted. Altricial; monogamous.

FAMILY XLVII.—COLUMBIDÆ.

(*The Doves.*)

Wings long, pointed. Tail never forked, of 12 or 14 feathers; male with the neck iridescent. Species about three hundred, found in most regions, but most abundant in the East Indies. Besides the following, quite a number of species occur in the Southern States. The common domesticated dove (*Columba livia*) is a fair type of the family.

* Tarsus feathered at the suffrago, shorter than the lateral toes; tail very long, wedge-shaped, of 12 feathers. ECTOPISTES, 1.

** Tarsus entirely bare, longer than the lateral toes.

† Tail long, pointed, of 14 feathers; length more than 10. ZENAIDURA, 2.

†† Tail short, rounded, of 12 feathers; length less than 8. CHAMÆPELIA, 3.

1. ECTOPISTES, Swainson. PASSENGER PIGEONS.

1. ***E. macrura,*** (L.) Sw. WILD PIGEON. Bluish with reddish and violet tinges, reddish below; L. 17; W. $7\frac{1}{2}$; T. 8. N. A., abundant; gregarious.

2. ZENAIDURA, Bonaparte. MOURNING DOVES.

1. ***Z. carolinensis,*** (L.) Bon. MOURNING DOVE. TURTLE DOVE. CAROLINA DOVE. Brownish olive, glossed with blue and wine color; plumage with metallic lustre; L. 12; W. $5\frac{3}{4}$; T. $6\frac{3}{4}$. U. S., abundant.

3. CHAMÆPELIA, Swainson. GROUND DOVES.

1. ***.C passerina,*** (L.) Sw. GROUND DOVE. Grayish olive, with bluish gloss; L. $6\frac{1}{4}$; W. $3\frac{1}{4}$; T. $2\frac{3}{4}$. Southern, N. to Washington, D.C.

ORDER L.—GALLINÆ.

(*The Gallinaceous Birds.*)

Bill short, stout, convex, horny, not constricted; nostrils scaled or feathered, cutting edge of upper mandible overlapping. Head often partly or wholly naked, sometimes with fleshy processes. Legs moderate, stout; hind toe elevated (excepting in *Cracidæ*, etc.), smaller than the other toes, sometimes wanting. Tarsus broadly scutellate (sometimes feathered), occasionally spurred in the males; claws blunt, not much curved. Wings short, strong, concave; tail various, sometimes wanting, often immensely developed. Precocial, often polygamous.

A large order comprising the various kinds of domesticated fowl as well as the chief game birds of most countries.

FAMILY XLVIII.—MELEAGRIDÆ.

(*The Turkeys.*)

Large birds, with the head and neck unfeathered, covered with scattered hairs, and more or less carunculate. Bill moderate; nostrils bare; forehead with an elongate fleshy process. Tarsus spurred in male; hind toe elevated. Tail nearly as long as wing, truncate, of more than twelve feathers. Breast of male mostly with a tuft of long bristles. Genus one; species two. *M. ocellatus*, of tropical America, and the common Turkey.

1. *MELEAGRIS,* Linnæus. TURKEYS.

1. ***M. gallopavo,*** L. WILD TURKEY. Glossy, coppery black; L. 48; W. 21; T. 18½. Canada to Rocky Mountains, and south to Mexico, becoming extinct eastwards. The domestic Turkey is descended from a Mexican variety.

FAMILY XLIX.—TETRAONIDÆ.

(*The Grouse.*)

Nostrils and tarsus densely feathered. Toes usually naked. Tail various with sixteen to twenty feathers. Usually a naked strip over eye; sides of neck often with a bare patch or lengthened feathers, or both. Genera seven; species fifteen; chiefly North American.

* Toes naked.
 † Tarsus feathered to the toes.
  ‡ Tail of 16 feathers; colors dark. . . . CANACE, 1.
  ‡‡ Tail of 18 feathers.
   a. Neck without peculiar feathers; middle tail feathers projecting. . . . . . . PEDIŒCETES, 2.
   aa. Neck with peculiar, elongated, lanceolate feathers above a large, bare, bright-colored patch. . CUPIDONIA, 3.
 †† Tarsus feathered about half way; tail of 18 soft, broad feathers. . . . . BONASA, 4.
** Toes feathered; winter plumage pure white. . LAGOPUS, 5.

1. **CANACE,** Reichenbach. AMERICAN GROUSE.

< *Tetrao,* L.

1. ***C. canadensis,*** (L.) Reich. SPRUCE PARTRIDGE. CANADA GROUSE. Black above with plumbeous markings; mostly black below with white spots; tail with an orange brown terminal band; ♀ smaller, black interrupted or streaky; L. 16; W. 6¾; T. 5½. Spruce swamps, N. U. S. and Northward.

2. **PEDIŒCETES,** Baird. SHARP-TAILED GROUSE.

1. ***P. phasianellus,*** (L.) var. ***columbianus,*** (Ord.) Coues. SHARP-TAILED GROUSE. Chiefly yellowish brown and white; sexes alike; L. 18; W. 8¾; T. 5. Illinois to Colorado, N. and W.

3. *CUPIDONIA,* Reich. Pinnated Grouse.

1. ***C. cupido,*** (L.) Baird. Prairie Hen. Prairie Chicken. Sides of neck with a tuft of long pointed feathers, beneath which is a patch of bare, red skin, capable of great inflation; black, tawny and white, barred and streaked; L. 17; W. 9; T. 4½; ♀ smaller. Prairies, etc., Martha's Vineyard to La. and N.; nearly exterminated eastward.

4. *BONASA,* Stephens. Ruffed Grouse.

1. ***B. umbellus,*** (L.) Stephens. Partridge (North.) Pheasant (South.) Crested; sides of neck with a ruff of soft dark feathers; variegated, reddish or grayish brown, with blackish and pale; L. 18; W. 7¼; T. 7. E. U. S., abundant in woodland.

5. *LAGOPUS,* Vieillot. Ptarmigans.

1. ***L. albus,*** (Gm.) Aud. White Ptarmigan. Willow Grouse. Fore parts cinnamon brown, variegated with blackish; in winter pure white; bill stout; L. 16; W. 8; T. 5. British America; N. U. S. (rarely, in winter.)

FAMILY L.—PERDICIDÆ.

(*The Partridges.*)

Nostrils unfeathered, protected by a naked scale; tarsus bare and scutellate, circumorbital space usually not bare; in most respects similar to the Grouse, but smaller. Our species are crested (excepting the common Quail) and Western or Southwestern.

1. *ORTYX,* Stephens. Bob-Whites.

1. ***O. virginianus,*** (L.) Bon. Quail (North.) Partridge (South.) Bob-White. Forehead, line through eyes, chin and throat white, brownish yellow in ♀;

crown dark; plumage generally chestnut red, barred and streaked; L. 9½; W. 5; T. 3. E. U. S., and West Indies; W. to Plains.

ORDER M.—LIMICOLÆ.

(*The Shore Birds.*)

Tibia more or less naked below (sometimes very slightly); legs, and usually neck also, elongated; hind toe free and elevated, often wanting. Head globose, abruptly sloping to the base of the bill, completely feathered (except in *Philomachus* ♂); gape short; bill weak, flexible, more or less soft-skinned, and therefore sensitive, blunt at tip, without hard cutting edges—fitted for probing in the mud; nostrils slit-like, surrounded by soft skin, never feathered; body never strongly compressed or depressed; nature precocial.

Birds of medium or small size, more or less aquatic; found in most regions; very abundant in America.

FAMILY LI.—CHARADRIIDÆ.

(*The Plovers.*)

Head rather large, nearly globose; bill of moderate length, shaped somewhat like a pigeon's bill, with a constriction behind the horny terminal portion; nasal fossæ lined with soft skin, through which the slit-like nostrils open. Wings long and pointed, usually reaching beyond the tip of the short tail, sometimes spurred. Toes usually three, with basal web; tarsus reticulated; tibiæ naked below. Sexes similar, but seasonal changes of plumage great. Species sixty or more, in most parts of the world.

* Plumage speckled; black below in breeding season.

† Hind toe present, very short. . . . SQUATAROLA, 1.

†† Hind toe absent. . . . . . . CHARADRIUS, 2.

** Plumage not speckled; head and neck with dark bands in the breeding season; toes 3. . . . . ÆGIALITIS, 3.

1. *SQUATAROLA*, Cuvier. WHISTLING PLOVERS.

1. ***S. helvetica***, (L.) Cuv. BLACK-BELLIED PLOVER. OX-EYE. Grayish, speckled; black below in breeding season, at other times white; L. 11½; W. 7; T. 3; B. 1¼; Ts. 2. In most parts of the world.

2. *CHARADRIUS*, L. GOLDEN PLOVERS.

1. ***C. dominicus***, Müll. GOLDEN PLOVER. FROST BIRD. Dark and grayish above, profusely speckled, some of the spots bright yellow; black below in breeding season, at other times grayish; L. 10½; W. 7; T. 3; B. 1; Ts. 1⅔. N. Am., a well known game bird.

3. *ÆGIALITIS*, Boie. RING-NECK PLOVERS.

* Bill black, rather long; L. 8 or more.

1. ***Æ. vociferus***, (L.) Cass. KILDEER PLOVER. Brown; rump bright orange brown; tail with black, white, and orange; two black bars across breast, and one above the white forehead; L. 9½; W. 6¼; T. 3½. N. Am., abundant in the Miss. Valley.

** Bill black-tipped, short and stout; L. 7 or less.

2. ***Æ. semipalmatus***, (Bon.) Cab. RING-NECK PLOVER. Dark ashy brown; black bands broad; feet semipalmate; L. 7. N. Am.

3. ***Æ. melodus***, (Ord) Cab. PIPING PLOVER. Very pale ashy brown, clear white below; dark bands narrow and faint; toes slightly webbed; L. 6¾. E. N. Am., abundant along the coast.

FAMILY LII.—HÆMATOPODIDÆ.

(*The Turnstones.*)

Bill hard, acute, or truncate; nasal fossæ short, broad, and shallow. Legs short, stout, brightly colored. Genera two, not much alike; species six or eight; in most parts of the world.

* Toes 3, webbed at base; tarsus reticulate, shorter than the truncate, compressed, almost woodpecker-like bill. HÆMATOPUS, 1.

** Toes 4, not webbed; tarsus scutellate in front, as long as the sharp, pointed bill. . . . . . . MORINELLA, 2.

1. *HÆMATOPUS,* Linnæus. OYSTER CATCHERS.

1. ***H. palliatus,*** Temminck. OYSTER CATCHER. Ashy brown and blackish, mostly white below; L. 18; W. 10; T. $4\frac{1}{2}$; B. 3. Coasts.

2. *MORINELLA,* Meyer & Wolf. TURNSTONES.

1. ***M. interpres,*** (L.) Stejn. TURNSTONE. Variegated; black, white, brown, and chestnut above; mostly white below; no reddish in winter; L. $8\frac{1}{2}$; W. 6; T. $2\frac{1}{2}$. Cosmopolitan; abundant.

FAMILY LIII.—RECURVIROSTRIDÆ.

(*The Avocets.*)

Legs excessively long. Bill very slender, long, acute, often recurved. Genera three, species eight; in most parts of the world. *Himantopus* is said to have the longest legs relatively of any bird.

* Toes 4, full webbed; bill recurved, flattened, tapering to a needle-like point; plumage beneath thickened as in ducks; swimmers. . . . . RECURVIROSTRA, 1.

** Toes 3, semipalmate; bill nearly straight, not flattened. HIMANTOPUS, 2.

1. ***RECURVIROSTRA,*** Linnæus. Avocets.

1. ***R. americana,*** Gm. Avocet. Blue Stocking. White, marked with black and cinnamon; legs blue; L. 18; W. 8; T. $3\frac{1}{2}$. U. S.

2. ***HIMANTOPUS,*** Brisson. Stilts.

1. ***H. mexicanus,*** (Müller.) Stilt. Long Shanks. Lawyer. Glossy black, white below, legs pink; L. 15; W. 9; T. 3; Ts. 4. U. S.

FAMILY LIV.—PHALAROPODIDÆ.

(*The Phalaropes.*)

Snipe-like birds with the toes lobed, as in the coots and grebes, but the lobes narrower. Swimmers; body depressed and the under plumage thick as in the Ducks. Tarsus much compressed. Three species representing as many genera; of northern regions of both hemispheres, southward in winter.

* Bill flattened; membranes scalloped. . . Phalaropus, 1.
** Bill subulate; membranes scalloped. . . Lobipes, 2.
*** Bill subulate; membranes plain. . . Steganopus, 3.

1. ***PHALAROPUS,*** Brisson. Red Phalaropes.

1. ***P. fulicarius,*** (L.) Bon. Red Phalarope. Variegated above, purplish chestnut below; young white below; L. 8; W. 5; T. $2\frac{3}{4}$; B. 1. Northern Am.

2. ***LOBIPES,*** Cuvier. Northern Phalaropes.

1. ***L. hyperboreus,*** (L.) Cuv. Northern Phalarope. Grayish black, variegated; rump and under parts white; sides of neck with chestnut stripe. Northern regions.

3. ***STEGANOPUS,*** Vieillot. Phalaropes.

1. ***S. wilsoni,*** (Sab.) Coues. Wilson's Phalarope.

Ashy above, variegated; rump and under parts white; sides of neck with a black stripe which changes to chestnut below. Northern regions.

FAMILY LV.—SCOLOPACIDÆ.

(*The Snipe.*)

Bill elongated, usually longer than the head; if short not plover-like, being soft-skinned throughout (hard when dry); nasal grooves narrow channels ranging from half to nearly the whole length of the bill; sides of lower mandible usually also grooved; nostrils narrow exposed slits; head feathered. Wings usually thin and pointed; tail short and soft; tibiæ rarely entirely feathered. Tarsus never entirely reticulate and usually scutellate in front and behind; hind toe present (except in *Calidris*); front toes cleft or slightly webbed; size medium or small. Sexes alike or female slightly larger; seasonal changes in plumage often strongly marked. Eggs usually four, placed with the small ends together in a slight nest or depression in the ground; notes various; mostly migratory or gregarious. Genera fifteen or more, species about ninety; chiefly of northern regions, but some species in most parts of the world.

* Toes 3. . . . . CALIDRIS, 8.

** Toes 4.

† Tarsus scutellate in front only; bill slender, decurved, very much longer than the head. . . . NUMENIUS, 15.

†† Tarsus scutellate in front and behind.

‡ Feet semipalmate; toes somewhat webbed at base.

a Tail barred crosswise, with light and dark colors.

b. Gape not reaching beyond base of culmen.

c. Culmen furrowed; length less than 12.

MACRORHAMPHUS, 4.

cc. Culmen unfurrowed; length more than 12. Limosa, 9.

bb. Gape reaching beyond base of culmen.

d. Length more than 9.

e. Bill longer than head. . . . Totanus, 10.

ee. Bill not longer than head.

f. Tail more than half the length of wing. Bartramia, 13.

ff. Tail less than half the length of wing. Machetes, 12.

dd. Length less than 9; second toe unwebbed.

g. Bill grooved nearly to tip; back not speckled with white; adult with black spots below. Tringoides, 11.

gg. Bill grooved about half way to tip; back speckled with white, not spotted below. . Totanus, 10.

aa. Tail not barred.

h. One minute web; primaries mottled with black. Tryngites, 14.

hh. Feet with two plain webs.

i. Bill about as long as head. . . Ereunetes, 6.

ii. Bill much longer than head. . Micropalama, 5.

‡‡ Toes not webbed at all.

j. First primary attenuate; bill straight, longer than head; culmen grooved. . . . . Scolopax, 2.

jj. First three primaries attenuate; bill as in *Scolopax*. Philohela, I.

jjj. Primaries not attenuate.

k. Bill straight, about twice as long as head. Gallinago, 3.

kk. Bill straight, much shorter than head; primaries mottled with black. . . . Tryngites, 14.

kkk. All other Sandpipers. . . . Tringa, 7.

1. PHILOHELA, Gray. American Woodcocks.

1. ***P. minor,*** (Gm.) Gray. American Woodcock.

Variegated, black, brown, gray, and russet; below warm brown; eye high and far back; L. 11; W. 5; B. 3; T. $1\frac{1}{4}$. E. U. S., in swamps, etc.

2. *SCOLOPAX,* Linnæus. European Woodcocks.

1. ***S. rusticola,*** L. European Woodcock. General appearance of *Philohela*, but a third larger. European; accidental on our Atlantic coast.

3. *GALLINAGO,* Leach. Snipe.

1. ***G. wilsoni,*** (Temm.) Bon. American Snipe. Wilson's Snipe. Back varied with black and bay; crown black, with a pale median stripe; bill straight, very long; L. 11; W. 5; B. $2\frac{1}{2}$; leg naked, 3; T. $2\frac{1}{3}$. E. U. S., abundant.

4. *MACRORHAMPHUS,* Leach. Red-Breasted Snipe.

1. ***M. griseus,*** (Gm.) Leach. Gray Snipe. Brown-Back. Blackish and grayish; breast bay in summer; bill long nearly as in *Gallinago;* L. 11; W. $5\frac{1}{2}$; T. $2\frac{1}{2}$. North America; abundant coastwise.

5. *MICROPALAMA,* Baird. Stilt Sandpipers.

1. ***M. himantopus,*** (Bon.) Baird. Stilt Sandpiper. Blackish, marked with chestnut, etc.; ashy gray in winter; bill nearly as in *Gallinago;* L. 9; W. 5; T. $2\frac{1}{4}$. N. Am., not abundant.

6. *EREUNETES,* Illiger. Sand-Peeps.

1. ***E. pusillus,*** (L.) Cass. Semipalmated Sandpiper. Peep. Plumage various, usually pale, white below; small; L. $6\frac{1}{2}$; W. $3\frac{3}{4}$; T. 2. N. Am.; abundant along beaches.

7. TRINGA, Linnæus. SANDPIPERS.

* Bill, tarsus, and middle toe with claw, of about equal length. (*Actodromas.*)

† Upper tail coverts (except the lateral series) black or dark brown; throat with an ashy or brownish suffusion and dusky streaks.

1. **T. minutilla,** Vieill. LEAST SANDPIPER. PEEP. Smallest of the Sandpipers, resembling *Ereunetes*, but the feet different; L. 6; W. $3\frac{1}{2}$; T. 2. N. Am., abundant.

2. **T. bairdii,** (Coues) Scl. BAIRD'S SANDPIPER. Colors of preceding but larger; throat but little streaked; L. 7 to $7\frac{1}{2}$; W. $4\frac{2}{3}$; T. $2\frac{1}{4}$; B. $\frac{7}{8}$. America, rare E. of the Mississippi R.

3. **T. maculata,** Vieill. PECTORAL SNIPE. JACK SNIPE. GRASS SNIPE. Crown unlike neck; throat ashy-shaded and sharply streaked; L. 9; W. $5\frac{1}{2}$; B. $1\frac{1}{8}$. N. Am., abundant.

†† Upper tail coverts white, with or without dusky marks; throat sharply streaked, with little if any ashy suffusion.

4. **T. fuscicollis,** Vieill. WHITE-RUMPED SANDPIPER. L. $7\frac{1}{2}$; W. $4\frac{3}{4}$; T. $2\frac{1}{4}$. E. U. S., abundant along the coast.

** Bill, tarsus, and middle toe, obviously not of equal length.

‡ Tarsus shorter than middle toe; tibiæ feathered. (*Arquatella.*)

5. **T. maritima,** Brünnich. PURPLE SANDPIPER. Ashy black with purplish reflections; feathers with pale edgings; lower parts, etc., mostly white; bill nearly straight; L. 9; W. 5; T. $2\frac{2}{3}$; B. $1\frac{1}{4}$. Atlantic Coast.

‡‡ Tarsus not shorter than middle toe; tibiæ bare below.

a. Bill slightly decurved, much longer than tarsus. (*Pelidna.*)

6. **T. alpina** (L.) var. **americana,** Cass. AM. DUNLIN. OX-BIRD. BLACK-BELLIED SANDPIPER. Chestnut brown above; feathers black centrally; belly, in summer,

with a broad black area; L. 9; W. 5; T. 2⅓; B. 1¾. N. Am.

aa. Bill perfectly straight. (*Tringa.*)

7. ***T. canutus,*** L. ROBIN SNIPE. RED-BREASTED SANDPIPER. Brownish black, brownish red (robin-like) below; L. 11; W. 6½; T. 2⅓. Atlantic Coast; abundant.

8. *CALIDRIS,* Cuvier. SANDERLINGS.

1. ***C. arenaria,*** (L.) Ill. SANDERLING. RUDDY PLOVER. Variegated; form of *T. canutus*, but the hind toe wanting; L. 8; W. 5; T. 2¼; B. 1. N. Am.; abundant coastwise.

9. *LIMOSA,* Brisson. GODWITS.

1. ***L. fedoa,*** (L.) Ord. GREAT MARBLED GODWIT. MARLIN. Cinnamon brown, variegated above, nearly uniform below; tail barred; no pure white; L. 16 to 22; W. 9; T. 3½; B. 4½. U. S., abundant along shores.

2. ***L. hœmastica,*** (L.) Coues. BLACK-TAILED GODWIT. Brownish black and reddish, more or less variegated above and below; some white; tail black, white at base; L. 15; W. 8; Ts. 2½; B. 3½. N. Am., rather northerly.

10. *TOTANUS,* Bechstein. TATTLERS.

* Toes with two sub-equal webs; legs dark or bluish. (*Symphemia.*)

1. ***T. semipalmatus,*** Gmelin. WILLET. SEMIPALMATED TATTLER. Grayish, variegated; L. 12 to 16; W. 7½; T. 3; B. 2½. U. S., common coastwise.

** Toes with the inner web very small; legs yellow. (*Glottis,* Nilsson.)

2. ***T. melanoleucus,*** Gm. GREATER TELL-TALE. YELLOW SHANKS. STONE SNIPE. Ashy brown, variegated; bill very slender; legs long; L. 12½; W. 7½; T. 3¼; B. 2¼. N. Am., frequent.

3. ***T. flavipes,*** Gm. LESSER TELL-TALE. YELLOW SHANKS. Colors as in preceding; smaller; legs longer; L. 11; W. 6½; T. 2½; B. 1¾. U. S., abundant.

*** Toes with inner web rudimentary; legs blackish. (*Rhyacophilus*, Kaup.)

4. ***T. solitarius,*** Wilson. SOLITARY TATTLER. Olive brown, streaked and speckled with whitish above; below white, breast with dusky suffusion; bill straight and slender; L. 9; W. 5; T. 2½; B. 1¼. U. S., abundant about secluded ponds, etc.

11. TRINGOIDES, Bonaparte. SPOTTED SANDPIPERS.

1. ***T. macularius,*** (L.) Gray. TIP-UP. TEETER-TAIL. SPOTTED SANDPIPER. Lustrous drab above, varied with black; pure white below, with round black spots in adult; L. 8; W. 4; T. 2; B. 1. U. S., every where.

12. MACHETES, Cuvier. RUFFS.

1. ***M. pugnax,*** (L.) RUFF (♂). REEVE (♀). Male in breeding season with a great ruff, and the face bare; ♀ without these characters; L. 10; W. 7; T. 2¼; B. 1¼. European; accidental on our coasts.

13. BARTRAMIA. UPLAND SANDPIPERS.

1. ***B. longicauda,*** (Bechst) Cs. UPLAND PLOVER. Dark grayish, variegated; L. 13; W. 7; T. 4; B. 1¼. U. S., abundant in fields, etc.

14. TRYNGITES, Cabanis. BUFF-BREASTED SANDPIPERS.

1. ***T. rufescens,*** (Vieill.) Cab. Grayish, reddish below; quills with white and finely mottled with black; L. 8; W. 5½; T. 2¼. U. S., with the last, but not common.

15. NUMENIUS, Linnæus. CURLEWS.

1. ***N. longirostris,*** Wils. LONG-BILLED CURLEW.

SICKLE BILL. Reddish gray, variegated; L. 24; W. 12; T. 4; B. 5 to 9. U. S., frequent.

2. ***N. hudsonicus,*** Lath. JACK CURLEW. Similar, but paler; L. 18; W. 9; T. 3½; B. 3 or 4. U. S., and northward.

3. ***N. borealis,*** (Forst.) Lath. ESQUIMAUX CURLEW. DOUGH BIRD. More reddish; L. 15 or less; W. 8½; T. 3; B. 2½. U. S., northwards.

ORDER N.—HERODIONES.

(The Herons and Storks.)

Birds usually of large stature, with compressed body, long legs and a very long "S-bent" neck; tibia naked below; toes long and slender, cleft or slightly webbed, the hind toe comparatively long and (usually) not elevated, provided with a large claw. Wings broad, rounded. Tail short. Head narrow, gradually contracting to the stout base of the bill, which is long and mostly hard and acute, with sharp cutting edges; lores, orbital space, and often whole head naked. Plumage with powder-down tracts (explained below); altricial.

FAMILY LVI.—ARDEIDÆ.

(The Herons.)

Large birds with the bill straight, longer than the head, compressed, acute, with sharp-cutting edges; upper mandible grooved; nostrils linear; lores naked, the bill appearing to run directly to the eyes; rest of head feathered; parts of the body with "powder-down tracts,"—strips of short, dusty, or greasy down-like feathers, usually three pairs of these strips, *i. e.*, on the back above the hips, on the belly under the hips, and on the breast; usually long plumes from the back or head in the breeding season. Wings broad. Tail very short. Tibiæ largely naked below; toes long and slender, hind toe on a level with the rest, middle claw pectinate. Sexes usually colored alike. Species nearly one hundred; in most parts of the world, abundant in the warmer regions.

* Tail of 12 feathers; usually a crest or train in the breeding season; lateral toes more than half length of tarsus.

† Tibia bare two inches or more.

‡ Length 36 or more.

a. General color bluish or ashy brown. . ARDEA, 1.

aa. Color white at all times. . . . HERODIAS, 2.

‡‡ Length 24 or less.

b. Color white at all times; legs black and yellow. GARZETTA, 3.

bb. General color bluish (young white), legs black or bluish. FLORIDA, 4.

†† Tibia bare one inch or less.

c. Tarsus shorter than middle toe and claw.

d. Bill more than thrice as long as high. . BUTORIDES, 5.

dd. Bill not four times as long as high. NYCTIARDEA, 6.

cc. Tarsus longer than middle toe and claw; bill more than half an inch deep at base. . . NYCTHERODIUS, 7.

** Tail of 10 feathers; no crest nor train; lower neck bare behind; length less than 30.

e. Length more than 18; tawny, much streaked. BOTAURUS, 8.

ee. Length less than 18; glossy blackish or chestnut. ARDETTA, 9.

1. ARDEA, Linnæus. HERONS.

1. ***A. herodias,*** L. GREAT BLUE HERON. Grayish blue, marked with black and white; back of head crested in breeding season; tibia and edge of wing chestnut brown; L. 48; W. 20; T. 7; B. 5½; Ts. 6½; ♀ much smaller. U. S., common.

2. HERODIAS, Gray. GREAT WHITE EGRETS.

1. ***H. egretta,*** (Gm.) Gray. GREAT WHITE EGRET. WHITE HERON. Pure white; head without lengthened feathers; back in breeding season with a long train; L. 40; W. 17; B. 5; Ts. 6. U. S., chiefly southerly.

3. GARZETTA, Bonaparte. LITTLE WHITE EGRETS.

1. ***G. candidissima,*** (Jacq.) Bon. SNOWY EGRET. Pure white; head and neck with long plumes in breeding season; L. 24; W. 12; B. 3; T. 4. Southern and middle States; abundant.

4. FLORIDA, Baird. LITTLE BLUE HERONS.

1. ***F. cœrulea,*** (L.) Baird. LITTLE BLUE HERON. Slaty blue; young white; head with elongated feathers; no dorsal plumes; L. 24; W. 12; B. 3; Ts. 4. U. S.; abundant, southerly.

5. BUTORIDES, Bonaparte. GREEN HERONS.

1. ***B. virescens,*** (L.) Bon. GREEN HERON. Crown, back and wings lustrous dark green; neck purplish cinnamon; crested; back with lengthened feathers; L. 18; W. 7; B. 2½. U. S., abundant.

6. NYCTIARDEA, Swainson. NIGHT HERONS.

1. ***N. grisea*** (L.) Steph., var. ***nœvia,*** (Bodd.) Allen. QUA BIRD. SQUAWK. NIGHT HERON. Bluish gray, crown and shoulders glossy green; no peculiar feathers save two or three long, white occipital plumes; young speckled, very different; L. 24; W. 14; B. 3; Ts. 3. U. S., frequent.

7. NYCTHERODIUS, Auctorum. YELLOW-CROWNED NIGHT HERONS.

1. ***N. violaceus,*** (L.) ——. YELLOW-CROWNED NIGHT

HERON. Grayish plumbeous; crested; back with long plumes; crown, etc., tawny or white; young speckled; size of last; B. $2\frac{3}{4}$; Ts. $3\frac{3}{4}$. U. S.

8. ***BOTAURUS,*** Stephens. BITTERNS.

1. ***B. lentiginosus,*** (Mont.) INDIAN HEN. STAKE DRIVER. BITTERN. Tawny brown of various shades, excessively variegated every where; dark patch on each side of neck; L. 23 to 28; W. 12; T. $4\frac{1}{2}$; B. 3. U. S., abundant.

9. ***ARDETTA,*** Gray. LEAST BITTERN.

1. ***A. exilis,*** (Gm.) Gray. LEAST BITTERN. ♂ chiefly glossy greenish black above, brownish yellow below, neck and shoulders with chestnut; ♀ with purplish chestnut instead of black; L. 14; W. 5; T. $1\frac{3}{4}$; B. $1\frac{3}{4}$. U. S., rather rare.

FAMILY LVII.—TANTALIDÆ.

(The Ibises.)

Stork-like birds, usually of large size, with the head more or less bare of feathers when adult; neck and legs long; body small. Wings large and rounded. Tail very short. Tibia bare for some distance; toes 4; hind toe lengthened and low down. Genera four; species fifteen; swamps and lakes of warm regions. Sexes alike. Allied to the Storks (*Ciconiidæ*) of the Old World.

* Tarsus reticulate; bill very stout, tapering, decurved. TANTALUS, 1.

** Tarsus scutellate in front; bill grooved, curved (curlew-like.)

† Claws curved. . . . . . . EUDOCIMUS, 2.

†† Claws nearly straight. . . . . . PLEGADIS, 3.

1. ***TANTALUS,*** Linnæus. WOOD IBISES.

1. ***T. loculator,*** L. WOOD IBIS. White; quills, tail and primary coverts black; bare part of head and neck

bluish; L. 48; W. 20; B. 9. Southern States, N. to Ohio and Colorado.

2. *EUDOCIMUS,* Wagler. IBISES.

1. ***E. albus,*** (L.) WHITE IBIS. Pure white, wings with black; L. 24; W. 11; T. 4; B. 7. Southern States, N. to L. I.

3. *PLEGADIS,* Kaup. GLOSSY IBISES.

1. ***P. falcinellus,*** (L.) Kaup. Rich dark chestnut, with greenish and purplish on head; L. 24; W. 11; T. 4; B. 4½. S. States, N. to N. England.

ORDER O.—ALECTORIDES.

(The Cranes and Rails.)

Tibia naked below; neck, legs and feet much as in *Herodiones*, except that the hind toe is small and elevated, and provided with a small claw. Bill various, usually lengthened; head fully feathered or else extensively bald. Body more or less compressed. Wings short, rounded, concave. Tail very short and small; size various.

FAMILY LVIII.—GRUIDÆ.

(The Cranes.)

Very large birds with the head and neck extremely long. Wings large. Tail short. Head more or less naked, with scattered hair-like feathers. Plumage mostly compact. Bill as long or longer than head, straight and slender; tibiæ extensively naked; tarsus scutellate; toes rather short; hind toe highly elevated. Genera three; species fourteen, of various parts of the world.

1. **GRUS,** Linnæus. CRANES.

1. ***G. americanus,*** (L.) Ord. WHITE OR WHOOPING CRANE. Adult pure white with black on wings; bare part of head very hairy; young grayish, the head feathered; L. 50; W. 24; T. 9; Ts. 12; B. 6. U. S., rather southerly.

2. ***G. canadensis,*** (L.) Temm. BROWN OR SAND-HILL CRANE. Plumbeous gray, never whitening; head sparsely hairy; smaller. U. S., chiefly S. and W.

FAMILY LIX.—RALLIDÆ.

(The Rails.)

Birds of medium or small size, with compressed bodies and muscular legs. Wings and tail short. Hind toe short and elevated; front toes very long. Bill various, rather short. Plumage blended. Sexes alike. Species about one hundred and fifty, of most parts of the world.

* Forehead feathered; no frontal plate. (RALLINÆ.)
  † Bill decurved, longer than head. . . . RALLUS, 1.
  †† Bill straight, shorter than head. . . . PORZANA, 2.
** Forehead covered with a broad, horny, frontal plate.
  ‡ Toes scarcely or not lobate. (GALLINULINÆ.)
    a. Nostrils linear; tarsus less than 2. . GALLINULA, 3.
    aa. Nostrils nearly circular; tarsus about 2. IONORNIS, 4.
  ‡‡ Toes lobate, edged with broad flaps. (FULICINÆ.) FULICA, 5.

1. **RALLUS,** Linnæus. RAILS.

1. ***R. longirostris,*** Bodd. CLAPPER RAIL. SALT-WATER MARSH HEN. Olive brown, variegated with ashy; dull reddish brown below; L. 14 to 16; W. 6; T. $2\frac{1}{4}$; B. $2\frac{1}{2}$; ♀ smaller. Salt marshes; rather southerly.

2. ***R. elegans,*** Aud. KING RAIL. FRESH-WATER MARSH HEN. Brownish black, with chestnut below

and on wing coverts; much brighter colored than the last, and rather larger. U. S., fresh-water marshes.

3. ***R. virginianus,*** L. VIRGINIA RAIL. Colors exactly as in *R. elegans;* much smaller; L. 10; W. 4; T. 1½; B. 1½. U. S., frequent.

2. *PORZANA,* Vieillot. LITTLE RAILS.

1. ***P. carolina,*** (L.) V. CAROLINA RAIL. SORA. "ORTOLAN." Olive-brown, variegated; face and middle line of throat black; breast slaty gray; back streaked; belly barred; L. 9; W. 4½; T. 2. U. S., not rare.

2. ***P. noveboracensis,*** (Gm.) Cass. YELLOW RAIL. Variegated above; L. 6; W. 3¼; T. 1½. E. U. S., not common.

3. ***P. jamaicensis,*** (Gm.) Cass. BLACK RAIL. Blackish; L. 5½. S. Am., etc., rarely in U. S.

3. *GALLINULA,* Brisson. GALLINULES.

1. ***G. galeata,*** (Licht.) Bon. FLORIDA GALLINULE. Brownish olive above, grayish black on head and below; bill, frontal plate and ring around tibia red; L. 15; W. 7½; T. 3½; Ts. 2. S. States, straying northward. (Manitowoc, Wis. *Jordan.*)

4. *IONORNIS,* Reich. PURPLE GALLINULES.

1. ***I. martinica,*** (L.) Reich. PURPLE GALLINULES. Olive green; head and below purplish blue; crissum white; bill mostly red; L. 12; W. 7; T. 3. S. States, N. to Maine.

5. *FULICA,* Linnæus. COOTS.

1. ***F. americana,*** Gm. COOT. MUD HEN. Dark slate color or sooty; bill brownish; L. 14; W. 8; T. 2. U. S., abundant in reedy swamps; swims well.

ORDER P.—LAMELLIROSTRES.

(*The Anserine Birds.*)

Bill lamellate, *i. e.*, furnished along each cutting edge with a regular series of tooth-like processes, which correspond to certain laciniate processes of the fleshy tongue, which ends in a horny tip; bill large, thick, high at base, depressed towards the end, membranous except at the obtuse tip which is occupied by a horny nail; no gular pouch. Head high, compressed, with sloping forehead; eyes small. Feet 4-toed (excepting some Flamingoes), palmate; hind toe small, elevated; tibia feathered in *Anatidæ*, bare below in the Flamingoes. Wings strong, short. Legs short (except in *Phœnicopteridæ*, where excessively elongated); precocial; swimming birds. An important and familiar order, comprising nearly all the "Water Fowl" which are valued in domestication or as game birds. There are two families, *Phœnicopteridæ* the Flamingoes, and the following:

FAMILY LX.—ANATIDÆ.

(*The Ducks.*)

Characters of bill, etc., as given above. Body heavy, flattened beneath. Head large; eyes small. Tail various, usually short, of 14 to 16 feathers, the lower coverts being long and full. Feet short, anterior toes full-webbed. Sexes usually quite unlike (excepting among the Swans and Geese.) Species one hundred and seventy-five, of all parts of the world; migratory. The sub-families are indicated below.

* Lores naked; adult entirely white; large birds; Swans. (CYGNINÆ.) . . . . CYGNUS, 1.

** Lores feathered; tarsus entirely reticulate; Geese. (ANSERINÆ.)

a. Bill and legs not black; colors white, bluish, etc. ANSER, 2.

aa. Bill and legs black; neck black. . . Bernicla, 3.

*** Lores feathered; tarsus scutellate in front; Ducks.

† Bill depressed; the lamellæ simple, bluntish.

‡ Hind toe simple, not bordered by membrane. "River Ducks." (Anatinæ.)

b. Head crested; tip of bill formed entirely by the nail; colors brilliant in ♂. . . . . . Aix, 11.

bb. Bill very much widened towards the tip; speculum green. . . . . . . Spatula, 10.

bbb. Head not crested; bill not much widened towards tip.

c. Tail wedge-shaped, at least ¾ length of wing. ♂ of Dafila, 5.

cc. Tail less than half length of wing.

d. Speculum white; wing coverts chestnut. Chaulelasmus, 6.

dd. Speculum violet, bordered with black and white. Anas, 4.

ddd. Speculum greenish purple, bordered by black, white and buff; crown streaked; tail feathers acute. ♀ of Dafila, 5.

dddd. Speculum green.

e. Wing coverts mostly white; crown whitish. Mareca, 7.

ee. Wing coverts sky-blue; head of ♂ plumbeous or purplish. . . . Querquedula, 8.

eee. Wing coverts plain ashy; head of male chestnut with green band. . . . Nettion, 9.

‡‡ Hind toe lobed (bordered by membrane.) "Sea Ducks." (Fuligulinæ.)

h. Cheeks bristly; colors black and white (or gray.) Camptolæmus, 16.

hh. Tail pointed, longer than wings (in adult); bill black and orange. . . . . . Harelda, 15.

hhh. Tail rounded; the feathers stiff, narrow, exposed nearly to their bases, the upper coverts being very short. Erismatura, 20.

hhhh. Ducks with none of the above peculiarities.

i. Upper mandible gibbous at its unfeathered base; black or brown. . . . . . ŒDEMIA, 19.

ii. Upper mandible not gibbous where unfeathered.

j. Nail at tip of bill narrow and distinct.

k. Head black or brown; nostrils sub-basal; bill longer than tarsus. . . . FULIX, 12.

kk. Head reddish or brownish, without white; nostrils nearly median; bill longer than tarsus. AYTHYA, 13.

kkk. Head black or gray, with white; nostrils nearly median; bill about as long as tarsus. CLANGULA, 14.

jj. Nail broad, scarcely distinct.

l. Feathers extending on culmen and partly on sides of upper mandible. . . SOMATERIA, 18.

ll. Feathers not extending on culmen; bill small, much tapering. . . HISTRIONICUS, 17.

†† Bill narrow, nearly cylindrical; the lamellæ acute, recurved, like saw-teeth; usually crested. Fish Ducks. (MERGINÆ.)

m. Bill not black; tarsus more than half the length of middle toe. . . . . MERGUS, 21.

mm. Bill black; tarsus half length of middle toe. LOPHODYTES, 22.

1. **CYGNUS,** Linnæus. SWANS.

> *Olor*, Wagler.

1. **C. buccinator,** Rich. TRUMPETER SWAN. Tail (normally) 24 feathered; bill without yellow spot, longer than head; nostrils sub-basal; L. about 50. Miss. Valley, W. and N.

2. **C. columbianus,** (Ord.) Coues. WHISTLING SWAN. Tail 20 feathered; bill with a yellow spot, not longer than head; nostrils median; L. 50. N. Am. (*C. americanus*, Sharpless.)

2. ANSER, Linnæus. GEESE.

1. ***A. albifrons,*** Gm., var. ***gambeli,*** (Hartl.) Coues. WHITE-FRONTED GOOSE. SPECKLE-BILL. White or gray, blotched with black; back dark; head and neck grayish brown; forehead white in adult; claws pale; lamellæ usual; L. 27; W. 17; T. 6; Ts. 3. N. Am.

2. ***A. cœrulescens,*** L. BLUE GOOSE. Size and form of next, but plumage ashy, varied with dark brown. N. Am., rather rare.

3. ***A. hyperboreus,*** Pallas. SNOW GOOSE. Adult pure white or washed with reddish; wings with black; claws dark; young bluish; lamellæ very prominent; L. 30; W. 19; T. $6\frac{1}{2}$; B. $2\frac{1}{2}$.

3. BERNICLA, Steph. BRANT GEESE.

= *Bernicla*, most authors.

1. ***B. bernicla,*** (L.) BRANT GOOSE. Head, neck, front, quills, and tail, black; white patch on neck; white on rump, crissum, etc.; back brownish gray; L. 24; W. 13; T. 5; B. $1\frac{1}{3}$. Northern States; in winter to Carolina.

2. ***B. canadensis,*** (L.) WILD GOOSE. CANADA GOOSE. Grayish brown, paler below; head and neck black; white throat patch, extending on sides of head; tail black; upper coverts white; L. 36; W. 20; T. $7\frac{1}{2}$; B. 2. N. Am., abundant; U. S. in winter.

4. ANAS, Linnæus. DUCKS.

1. ***A. boscas,*** L. MALLARD DUCK. TAME DUCK. ♂ head and upper neck rich glossy green, a white ring below; breast purplish chestnut; speculum violet; wing coverts tipped with black and white; ♀ duller, chiefly dull ochraceous, streaked with dark brown; L. 24; W. 12. Am., abundant; commonest westward. Original

of the common Domestic Duck; various hybrids of this species with others are described.

2. ***A. obscura,*** Gm. BLACK DUCK. Size of mallard and resembling the ♀, but darker; no decided white except under the wings. E. U. S., common.

5. *DAFILA,* Leach. PINTAIL DUCKS.

1. ***D. acuta,*** (L.) Jenyns. PIN-TAIL. SPRIG-TAIL. ♂ dark brown with purplish gloss; sides of neck with long white stripes; tail cuneate when developed, central feathers much projecting; ♀ speckled and streaked; tail shorter; L. 24; W. 11; T. 9 or less. N. Am.

6. *CHAULELASMUS,* Gray. GADWALLS.

1. ***C. streperus,*** (L.) Gray. GADWALL. ♂ barred, black and white, wing coverts chestnut, greater coverts black, speculum white; ♀ with similar markings; L. 22; W. 11. N. Am.

7. *MARECA,* Stephens. WIDGEONS.

1. ***M. penelope,*** (L.) Bon. EUROPEAN WIDGEON. Head and neck reddish brown; top of head brownish white; sides of head with green traces; L. 22; W. 11; T. 5. Europe; accidental in America, Wis. (*Kumlien*) and Atlantic Coast.

2. ***M. americana,*** (Gm.) Steph. AMERICAN WIDGEON. BALDPATE. Head and neck grayish, speckled; colors more emphatic; sides of head with bright green patch. N. Am., abundant.

8 *QUERQUEDULA,* Stephens. BLUE WINGED TEALS.

1. ***Q. discors,*** (L.) Steph. BLUE WINGED TEAL. ♂ head and neck blackish plumbeous, darkest on the crown; a white crescent in front of eye; under parts

thickly spotted; ♀ quite different, known by the wings; L. 16; W. 7; T. 3. E. U. S., to Rocky Mts.

9. *NETTION,* Kaup. GREEN-WINGED TEALS.

1. ***N. carolinense,*** (Gm.) Kaup. GREEN-WINGED TEAL. A white crescent on sides in front of wings; shoulders plain; L. 15; W. 7½; T. 3½. N. America, common.

10. *SPATULA,* Boie. SHOVELLERS.

1. ***S. clypeata,*** (L.) Boie. SHOVELLER. SPOON-BILL DUCK. ♂ head and neck green; wing coverts blue; speculum green; ♀ with similar bill and wings; L. 20; W. 9½; B. 2¾. N. Am.

11. *AIX,* Swainson. WOOD DUCKS.

1. ***A. sponsa,*** (L.) Boie. WOOD DUCK. SUMMER DUCK. Crested; ♂ head iridescent green and purple, with white stripes and a forked white throat patch; breast rich brownish; ♀ duller, head mostly gray; L. 20; W. 9½; T. 5. U. S. frequent; nesting in trees.

12. *FULIX,* Sundevall. FLOCKING-FOWL.

< *Fuligula*, Authors.

1. ***F. marila,*** (L.) Baird. BIG SCAUP DUCK. BLUE BILL. RAFT DUCK. Speculum white; no ring about neck; back and sides whitish, finely waved with black; ♀ face white; markings less distinct; L. 20; W. 9. N. Am.

2. ***F. affinis,*** (Eyton) Baird. LESSER SCAUP DUCK. Similar, but smaller; L. 16; W. 8. N. Am., rather southerly.

3. ***F. collaris,*** (Donovan) Baird. RING-NECKED DUCK. Speculum gray; an orange brown collar about neck; ♀ without collar; L. 18; W. 8½. N. Am.

13. AYTHYA, Boie. CANVAS-BACK DUCKS.

1. ***A. ferina*** (L.) var. ***americana,*** (Eyton) Allen. RED HEAD. POCHARD. ♂ head and neck chestnut with red reflections; back mixed silvery and black; the dark waved lines unbroken; ♀ duller; bill shorter than head, two or less, bluish, the nail dark; L. 20; W. 10. N. Am., abundant.

2. ***A. vallisneria,*** (Wilson) Boie. CANVAS-BACK DUCK. Head more dusky; black wavy lines on back broken, the whitish predominating; bill as long as head, 2½ or more, dusky. N. Am.; especially coastwise in winter.

14. CLANGULA, Fleming. GOLDEN-EYES.

1. ***C. clangula,*** (L.) GOLDEN-EYE. GARROT. ♂ head puffy, glossy green with some white; upper parts black; white continuous on outer surface of wing; ♀ head duller, snuff-colored and scarcely puffy; L. 16 to 19; W. 8 to 9. N. Am. and Europe.

2. ***C. islandica,*** (Gm.) Bp. BARROW'S GOLDEN-EYE. Similar; gloss of head purplish; white of wing divided by dark bar; more white on head; larger. N. U. S. and N.; rare.

3. ***C. albeola,*** (L.) Steph. DIPPER. BUFFLE-HEAD. BUTTER-BALL. SPIRIT DUCK. ♂ with head very puffy and iridescent; a large white ear patch; L. 16; W. 7; ♀ small, dark gray; head scarcely puffy. N. Am., abundant.

15. HARELDA, Leach. LONG-TAILED DUCKS.

1. ***H. hyemalis,*** (L.) SOUTH-SOUTHERLY. OLD WIFE. LONG-TAILED DUCK. Reddish brown, nearly white in winter; tail very long; ♀ quite different, no

white on wing; L. 20; W. 9; T. 8, or less. N. Am. and Europe; chiefly northern and coastwise.

16. CAMPTOLÆMUS, Gray. PIED DUCKS.

1. ***C. labradorius,*** (Gm.) Gray. LABRADOR DUCK. ♂ chiefly black and white; ♀ plumbeous; L. 24; W. 9. Coast, chiefly northern; scarce.

17. HISTRIONICUS, Lesson. HARLEQUIN DUCKS.

1. ***H. histrionicus,*** (L.) HARLEQUIN DUCK. ♂ leaden bluish, much varied; speculum violet and purple; ♀ dark brown, etc. Atlantic Coast, Am. and Europe.

18. SOMATERIA, Leach. EIDER DUCKS.

1. ***S. mollissima,*** (L.) Leach. EIDER DUCK. ♂ in breeding dress, white; under parts, rump, quills, and crown patch black; ♀ reddish brown, streaked; bill with long, club-shaped, frontal processes extending in line with culmen; L. 24; W. 12. Arctic regions; S. to New England in winter. (*S. dresseri*, Sharpe.)

2. ***S. spectabilis,*** (L.) Leach. KING EIDER. ♂ chiefly black; front parts, etc., white; frontal processes broad, squarish, out of line of culmen; slightly smaller. Northern regions; S. to N. Y.

19. ŒDEMIA, Fleming. SURF DUCKS.

* Bill not encroached upon by frontal feathers; tail 16-feathered; no white on wings. (*Œdemia.*)

1. ***Œ. americana,*** Sw. AMERICAN BLACK SCOTER. ♂ entirely black; ♀ sooty brown, paler below and on throat; L. 18 to 24; W. 10. N. Am., all coasts.

** Bill broadly encroached upon by frontal feathers; a large white wing patch. (*Melanetta.*)

2. ***Œ. fusca,*** (L.) Sw. VELVET SCOTER. WHITE

WINGED SURF DUCK. ♂ black; white spot under eye; ♀ sooty brown, rather larger. Shores of Europe and N. Am.

*** Bill narrowly encroached upon by frontal feathers; no white on wings; tail 14-feathered. (*Pelionetta.*)

3. ***Œ. perspicillata,*** (L.) Fleming. SURF DUCK. SEA COOT. ♂ black, with white spot on forehead and nape; ♀ sooty brown; white patch on lores and cheeks; size of first. Coasts.

20. ERISMATURA, Bonaparte. STIFF TAILED DUCKS.

1. ***E. rubida,*** (Wils.) Bon. RUDDY DUCK. Chiefly brownish or tawny (reddish in perfect plumage), considerably waved and dotted; crissum white; L. 17; W. 6. N. Am., frequent.

2. ***E. dominica,*** (L.) Eyton. SAN DOMINGO DUCK. Smaller and redder; forehead and chin black; L. 13½; W. 6¼. S. America and W. Indies; accidental N. (Wis., *Kumlien*, L. Champlain, *Cabot.*)

21. MERGUS, Linnæus. MERGANSERS.

1. ***M. merganser,*** L. MERGANSER. GOOSANDER. FISH DUCK. ♂ black and white above, salmon-colored below; head glossy green, scarcely crested; ♀ smaller, ashy gray; head brownish; nostrils median; L. 24; W. 11. N. Am., common.

2. ***M. serrator,*** L. RED-BREASTED MERGANSER. FISH DUCK. Similar, but smaller and more crested; ♂ with throat reddish brown, black-streaked; wing with two black bars, instead of one as in last; nostrils sub-basal; L. 20; W. 9. N. Am., abundant.

22. LOPHODYTES, Reichenbach. CRESTED DIVERS.

1. ***L. cucullatus,*** (L.) Reich. HOODED MERGANSER.

Sheldrake. Black and white; sides chestnut in ♂; ♀ duller and grayish; crest high and compressed; nostrils sub-basal; L. 19; W. 8. N. Am., common.

ORDER Q.—STEGANOPODES.

(*The Totipalmate Birds.*)

Feet totipalmate; hind toe lengthened, scarcely elevated, united by a web to the other toes; tibiæ feathered Bill various, horny, never lamellate, cutting edges often serrate; nostrils very small or abortive; a prominent, naked, gular pouch; tarsus reticulate; altricial.

We here omit the families *Sulidæ* (Gannets) and *Tachypetidæ* (Frigate Birds) as they are exclusively marine. One species of the Southern family *Plotidæ*, (the Darters) *Plotus anhinga*, L., the Snake Bird or Water Turkey of the Southern swamps, sometimes comes up the Miss. R. to S. Ills.

FAMILY LXI.—PELECANIDÆ.

(*The Pelicans.*)

Large fish-eating birds, with very long bills which end in a claw-like hook; the broad space between the branches of the lower jaw occupied by a huge membranous sack; nostrils abortive; wings very long; tail very short; gregarious; sexes alike. Genus one; species six; found in most warm regions.

1. *PELECANUS,* Linnæus. Pelicans.

1. ***P. trachyrhynchus,*** Lath. White Pelican. Chiefly white, some black and yellowish; L. 60; W. 24; B. 12. N. Am., abundant S. and W., often inland.

FAMILY LXII. — PHALACROCORACIDÆ.

(*The Cormorants.*)

Bill about as long as head, nearly terete, strongly hooked, the cutting edges uneven; gular pouch small. Wings short. Tail very large, almost scansorial, of very stiff feathers, often used with the aid of the legs, which are set far back, as a support for the body; a nasal groove but nostrils abortive. Colors in both sexes lustrous, iridescent black; in the breeding season usually with long, white, filamentous plumes; many species crested. Genus one; species twenty-five; of most regions.

1. *PHALACROCORAX*, Brisson. CORMORANTS.

2. ***P. dilophus***, (Sw.) DOUBLE-CRESTED CORMORANT. Glossy greenish black; back and wing coverts coppery gray; adult with two curly black lateral crests; sac convex or straight-edged behind, orange; L. 33; W. 13; T. 7; tail of 12 feathers. N. Am.; our commonest species.

2. ***P. mexicanus***, (Brandt.) MEXICAN CORMORANT. Gular sac orange, white-edged; L. 24. S. W., N. to Ills.

3. ***P. carbo***, (L.) NORTHERN CORMORANT. Tail of 14 feathers; sac heart-shaped behind; L. 36. Northern and coastwise.

ORDER R. — LONGIPENNES.

(*The Long-Winged Swimmers.*)

Feet palmate; tibiæ feathered; legs near center of equilibrium; hind toe elevated, small, often wanting. Bill usually long, horny, not serrate nor lamellate; nostrils developed; no gular pouch. Wings very long and pointed. Tail well developed; altricial; powers of flight remarkable; food chiefly fishes. There are two families, *Laridæ*, below described, and *Procellaridæ*, the Petrels, which we here omit, all our numerous representatives being strictly maritime.

FAMILY LXIII. — LARIDÆ.

(*The Gulls.*)

Long-winged birds, with the nostrils not tubular; bill various. Hind toe small and elevated, but less so than in the Petrels. General color usually white, with a darker mantle of a pearly bluish tint, and commonly with some black markings. Sexes alike in color, but the plumage varying much with age and season. Genera about twelve (*Coues*), sixty (European authors); species ninety; abounding about all large bodies of water. Of the genera admitted below, *Pagophila*, *Rissa*, and *Chrœcocephalus* may properly be considered as sections of *Larus*, while *Gelochelidon* and *Thalasseus* are perhaps sub-genera under *Sterna*.

* Bill hooked (epignathous) — rarely not hooked, and the tail even.
- † Bill with a sort of cere; middle tail feathers exserted; Jægers. (LESTRIDINÆ.) . . . . STERCORARIUS, 1.
- †† Bill not cered; general color usually white with a darker mantle. Gulls. (LARINÆ.)
  - *a.* Hind toe rudimentary, without a developed claw. RISSA, 3.
  - *aa.* Hind toe perfect, provided with a claw.
    - *b.* Tail even.
      - *c.* Tarsus black, rough; webs incised; plumage white. GAVIA, 4.
      - *cc.* Tarsus not black; lower plumage white in adult.
        - *d.* Head white—if dark below, head not whitish (species of large size; never rosy-tinted below; the head never with a dark hood.) . LARUS, 2.

dd. Head dark—if dark below, head whitish (small or slender species, with a black hood in the breeding season, and the white under parts then pinkish or rosy-tinted.) . . . CHRŒCOCEPHALUS, 5.

bb. Tail forked; bill black, yellow-tipped. . XEMA, 6.

** Bill paragnathous (mandibles even); tail forked (in our species); Terns. (STERNINÆ.)

e. Toes full-webbed; colors chiefly white, with a black cap at most seasons and the quills silvery dusky, with a long white stripe.

f. Feet black; forehead without white crescent.

g. Not crested; bill stout, scarcely longer than tarsus. GELOCHELIDON, 7.

gg. Crested; bill slender, much longer than tarsus. THALASSEUS, 8.

ff. Feet not black; back pale, no crest. . . STERNA, 9.

ee. Toes not full-webbed; color quite dark. HYDROCHELIDON, 10.

*** Bill hypognathous—the lower mandible much the longer, compressed like a knife-blade. Skimmers. (RHYNCHOPINÆ.) RHYNCHOPS, 11.

1. **STERCORARIUS,** Brisson. JÆGERS.

= *Lestris*, Authors.

1. **S. pomatorhinus,** (Temm.) Lawr. POMARINE JÆGER. Chiefly blackish, colors varying with age; middle tail feathers broad to the tip, projecting about four inches; L. 20; W. 15. Northern, U. S. in winter.

2. **S. parasiticus,** (Brünn.) Gray. PARASITIC JÆGER. General color dark brown; middle tail feathers acuminate, projecting 4 inches; L. 18; W. 13. Northern, U. S. in winter.

3. **S. longicauda,** (Vieill.) LONG TAILED JÆGER. Similar, but still smaller; tail feathers filamentous, projecting 8 or 10 inches. Northern, U. S. in winter.

2. *LARUS,* Linnæus. GULLS.

* Primaries without any black.

1. ***L. glaucus,*** Brünn. GLAUCOUS GULL. ICE GULL. BURGOMASTER. Bill yellow with red spot on lower mandible; large; L. 30; W. 18. Arctic regions; S. in winter.

2. ***L. leucopterus,*** Faber. WHITE-WINGED GULL. Similar but smaller; L. 23; W. 17. Same region.

** Primaries crossed with black (adult), or all black (young).

3. ***L. marinus,*** L. GREAT BLACK-BACKED GULL. COFFIN-CARRIER. SADDLE-BACK. Mantle blackish slate color; largest of our Gulls; L. 30 or more; W. 18; feet flesh colored. N. Atlantic, S. in winter.

4. ***L. argentatus,*** Brünn. HERRING GULL. COMMON GULL. Mantle grayish blue; large, 22 to 27 ; W. 18 or less; feet flesh colored. N. Am., abundant.

5. ***L. delawarensis,*** Ord. RING-BILLED GULL. Plumage like preceding; feet olivaceous; webs yellow; bill yellowish, a black band at the tip; size moderate; L. 20; W. 15. N. Am., abundant.

3. *RISSA,* Leach. KITTIWAKES.

1. ***R. tridactyla,*** (L.) Bon. KITTIWAKE GULL. Mantle dark grayish blue; hind claw a minute knob; L. 16 to 18; W. 12. Northern, U. S. in winter.

3. *GAVIA,* Boie. IVORY GULLS.

1. ***G. alba,*** (Gunner.) IVORY GULLS. Adults pure white; young spotted ; L. 16 to 20; W. 12. Northern, rarely to U. S. in winter.

5. *CHRŒCOCEPHALUS,* Eyton. ROSY GULLS.

1. ***C. atricilla,*** (L.) Lawr. BLACK-HEADED OR LAUGHING GULL. Tarsus $\frac{1}{4}$ longer than middle toe and claw;

large; bill and feet dusky carmine; L. 16 to 19; W. 12 to 13. U. S., coastwise.

2. ***C. franklini,*** (Rich.) Bruch. FRANKLIN'S ROSY GULL. Tarsus about as long as middle toe and claw; bill and feet carmine; bill usually with a black mark; medium; L. 14 to 16; W. 11. U. S., chiefly W. of the Miss. R.

3. ***C. philadelphia,*** (Ord) Lawr. BONAPARTE'S GULL. Tarsus about as long as middle toe and claw; bill dark or black, slender, tern-like; small; L. 12 to 14; W. 10. N. Am., abundant.

6. ***XEMA,*** Leach. FORK-TAILED GULLS.

1. ***X. sabinei,*** (Sab.) Leach. FORKED-TAIL GULL. Chiefly white, a black hood and collar; L. 14; W. 11. Northern, S. in winter to N. Y.

7. ***GELOCHELIDON,*** Brehm. GULL-BILLED TERNS.

1. ***G. anglica,*** (Montagu) Bon. MARSH TERN. Bill black, very short and stout; L. 15; W. 12. E. U. S., not abundant.

8. ***THALASSEUS,*** Boie. CRESTED TERNS.

1. ***T. caspius,*** (Pallas) Boie. CASPIAN TERN. Primaries without white band; bill red; much the largest of the Terns; L. 20 or more; W. 17; T. 6, not much forked. Northern, S. in winter; scarce.

2. ***T. regius,*** Gamb. ROYAL TERN. Bill orange; L. 18 or 20; W. 15; T. 8, deeply forked; much smaller than the last but nearly as long. Atlantic Coast.

3. ***T. cantiacus,*** (Gm.) Boie. SANDWICH TERN. Bill black, yellow at tip; L. 16; W. 12½; T. 6. Europe and Am.; rare on our coast.

9. **STERNA,** Linnæus. COMMON TERNS.

1. **S. hirundo,** Auct. COMMON TERN. SEA SWALLOW. WILSON'S TERN. Bill red, blackening towards tip; tail mostly white; outer web of outer feather darker than inner; L. 14½ (13 to 16); W. 10 (9½ to 11¾); T. 6 (5 to 7.). Coasts of Europe and America; abundant. (*S. wilsoni*, Lawr.)

2. **S. forsteri,** Nuttall. FORSTER'S TERN. Larger; tail longer and wings shorter; inner web of outer tail feather darker; W. 9½ to 10½; T. 6½ to 8. N. Am., common.

3. **S. macrura,** Naumann. ARCTIC TERN. Bill carmine throughout; plumage as in *hirundo*, but darker below; L. 14 to 17; W. 10 to 12; T. 5 to 8; smaller than *hirundo*, but tail proportionally much longer. Northern regions, S. to U. S.

4. **S. dougalli,** Mont. ROSEATE TERN. Bill black, usually orange at base below; mantle very pale; somewhat rosy-tinted below; L. 12 to 16; W. 9 to 10; T. 5 to 8. Atlantic Coast, abundant. (*S. dougalli*, Mont.)

5. **S. portlandica,** Ridgway. PORTLAND TERN. Near the preceding, but mantle as in *hirundo;* the rump white instead of pearly; feet blackish; under parts pure white; L. 12½; W. 9¾; T. 5 or more. Lately discovered in Maine and Mass.; but two specimens known.

6. **S. superciliaris,** (Vieill.) var. **antillarum,** (Lesson) Coues. LEAST TERN. Bill yellow, usually tipped with black; a white frontal crescent between cap and bill; shafts of two or more outer primaries black above; very small; L. 8 or 9; W. 6¼; T. 2 to 3½. U. S., chiefly abundant coastwise.

10. HYDROCHELIDON, Boie. BLACK TERNS.

1. ***H. nigra,*** (L.) Stejn. BLACK TERN. Head, neck and under parts black (in full plumage); wings and tail above plumbeous like the back; crissum white; small; L. 10; W. 8 to 9; T. 3½. N. Am., chiefly inland. [*H. fissipes*, (L.) Gray.]

2. ***H. leucoptera,***(Meisn.) WHITE-WINGED BLACK TERN. Wings whitening along border of fore-arm; tail and upper tail coverts white. Straggler from Europe, a single specimen lately taken on Lake Koshkonong. (*Ludovic Kumlien.*) [*H. leucoptera*, (Meisn.) Boie.]

11. RHYNCHOPS, Linnæus. SKIMMERS.

1. ***R. nigra,*** L. BLACK SWIMMER. CUTWATER. Glossy black; white below; lower mandible about an inch longest, compressed like a knife-blade, obtuse at end; L. 16 to 20; W. 15; T. 5, sharply forked. Coast, abundant southward.

ORDER S.—PYGOPODES.

(*The Diving Birds.*)

Feet palmate or lobate; tibiæ feathered, buried in the skin nearly to the heel joint, hence the legs are set very far back, and the birds are scarcely able to walk at all on land; hind toe small, elevated, often wanting. Nostrils developed; bill of various forms, horny, not lamellate nor serrate; no gular pouch. Wings very short, scarcely reaching the base of the very small or rudimentary tail. Swimmers, many of them noted for their powers of diving. We here omit the three-toed family of ALCIDÆ, the Auks, they being strictly maritime and mostly northern. The twenty-one known species all occur in America.

FAMILY LXIV.—EUDYTIDÆ.

(*The Loons.*)

Bill long, strong, tapering, acute, wholly hard; nostrils linear. Head densely and evenly feathered, without ruffs or naked spaces; eye large. Feet 4-toed, palmate; tarsus reticulate, strongly compressed. Wings comparatively long and strong. Tail short, but well developed. Back of adult with small spots; precocial. Genus one; species three. Birds of large size, with strong powers of flight, and pre-eminent in swimming and diving, but scarcely able to walk; they are migratory, breeding northward, but coming S. in winter; the voice is singularly sharp and wild.

1. **URINATOR,** Cuvier. LOONS.

= *Eudytes*, Illiger.

1. ***U. immer,*** Brünn. GREAT NORTHERN LOON. DIVER. Black; breast and below chiefly white; head and neck iridescent, green and violet; a patch of white streaks on each side of neck and on the throat; back with many white spots; L. 36; W. 14; Ts. 3; B. 3, Northern Hemisphere; whole U. S. in winter. (*C. glacialis*, L.)

2. ***U. arcticus,*** L. BLACK-THROATED DIVER. Similar, but head and neck behind bluish or hoary gray; foreneck purplish black, with a crescent of white streaks; L. 28; W. 12; B. 2½. Northern hemisphere, not common in U. S.

3. ***U. lumme,*** Brünn. (L.) RED-THROATED DIVER. Blackish, chiefly white below; head and neck mostly bluish gray; throat with a large chestnut patch; L. 27; W. 11; B. 2. Northern hemisphere.

FAMILY LXV.—PODICIPIDÆ.

(*The Grebes.*)

Bill usually slender, rarely stoutish; lores naked; head often with crests, ruffs or ear tufts in the breeding season. Back not spotted; under plumage lustrous, mostly white. Wings very short. Tail rudimentary. Feet four-toed, lobate, the toes webbed at base; toes flattened, provided with flat claws resembling human nails; tarsus scutellate, compressed. Genera two; species about twenty; in all parts of the world, chiefly about fresh waters.

* Bill slender, straight, rather acute; loral strip narrow; head in breeding season with conspicuous crests or ruff. COLYMBUS, 1.

**Bill stout, somewhat hooked; loral strip broad; no ruff nor crest. . . . . PODILYMBUS, 2.

1. COLYMBUS, Linnæus. CRESTED GREBES.

= *Podiceps*, Latham.

1. ***C. cristatus,*** (L.) CRESTED GREBE. Upper parts generally dark brown; crest black; throat and sides of head white, becoming reddish on the ruff; primaries brown; secondaries mostly white; silky white below, not mottled; L. 24; W. 8½; B. 2. Northern hemisphere; U. S. in winter. (Omit: not American.)

2. ***C. holbolli,*** Reinhardt. RED-NECKED GREBE. Upper parts brown; front and sides of neck rich brownish red; throat and sides of head ashy; crests and ruffs not large; below silvery ash, spotted or mottled; L. 18; W. 8; B. 1¾. N. Am., U. S. in winter.

3. ***C. cornutus,*** Gm. HORNED GREBE. Dark brown; head glossy black; a brownish yellow band over eye and behind; fore-neck and breast brownish red; bill

compressed, black, tipped with yellow; crests and ruffs very large; L. 14; W. 6; B. 3¾. Northern hemisphere, abundant.

4. ***C. auritus,*** (L.) var. ***californicus,*** (Heerm.) EARED GREBE. Crest in the form of ear tufts; front of neck black; bill depressed; L. 12. Western, E. to Ills.

2. *PODILYMBUS,* Lesson. DAB-CHICK.

1. ***P. podicipes,*** (L.) Lawr. DIEDAPPER. HELL-DIVER. WATER WITCH. PIED-BILLED GREBE. Chiefly brownish gray; silvery ash below; bill bluish, with dark band; young and winter plumage different, but the bird resembles nothing else; L. 14; W. 5; B. 1. Whole of America, abundant. (*Podiceps carolinensis*, Lath.)

Class III. — Reptilia.

(*The Reptiles.*)

A Reptile is a cold-blooded, air-breathing vertebrate, having the exoskeleton developed as horny or bony plates, never as feathers or hair. Limbs, when present, usually adapted for walking, rarely for swimming, scarcely ever for flying. An incomplete double circulation, the ventricular septum being usually imperfect or wanting; no metamorphosis; oviparous, rarely ovoviviparous, the eggs relatively large and usually with a leathery skin. Various important anatomical distinctions exist, but the Reptiles are obviously separated from the Birds by the absence of feathers, and from the Batrachians by the presence of scales, and by the absence of gills after leaving the egg.

Besides the three following orders, a fourth (Crocodilia), is represented by two species *Alligator mississippiensis*, Daudin, and *Crocodilus americanus*, Seba, in our Southern States.

ORDERS OF REPTILIA.

* Body covered with square imbedded shields; vent roundish or longitudinal, plaited; bones of skull soldered together.

† Body short, depressed, enclosed between two bony shields, from which the head, limbs and tail may be protruded; no teeth. . . . . . . Testudinata, T.

** Body covered with imbricated scales; vent a cross-slit; bones of skull separate; jaws with teeth.

‡ Mouth not dilatable; bones of mandible united by a bony suture in front; limbs 4—rarely rudimentary. Lacertilia, U.

‡‡ Mouth very dilatable; bones of mandible united by ligaments; limbs wanting or represented only by short spurs on the sides of the vent. . . . . OPHIDIA, V.

T. FAMILIES OF TESTUDINATA.

* Carapace firm, not flexible at the margins, not greatly depressed; both shields with well-developed horny plates.

† Toes short, bound together by the integument; legs and feet short, club-shaped; carapace very convex; plastron covering nearly all of under surface of body; caudal shields united; claws blunt, 5–4; terrestrial. TESTUDINIDÆ, 66.

†† Toes well developed, spreading, and in aquatic species webbed; claws usually 5–4.

‡ Shell highest at about the middle, usually somewhat depressed, the margin flaring outwards; epidermal plates of the large plastron 12 in number. . EMYDIDÆ, 67.

‡‡ Shell highest behind the middle; margin of carapace turned rather downward or inward; plates of plastron 7, 9 or 11—never 12; size small. . CINOSTERNIDÆ, 68.

‡‡‡ Shell highest anteriorly; carapace flaring outward, its margin toothed behind; plastron small, cross-shaped with 12 plates and three accessory ones on each side; jaws powerful, strongly hooked; neck and tail long, the latter with a crest of tubercles; size large.
CHELYDRIDÆ, 69.

** Much depressed; carapace and plastron covered with a leathery skin, and flexible at the margins; no horny plates; fleshy lips; snout prolonged; toes 5–5, but claws 3–3.
TRIONYCHIDÆ, 70.

U. FAMILIES OF LACERTILIA.

* Tongue thick, convex, attached at its base to the gullet; scales usually more or less spinous. . . . IGUANIDÆ, 71.

** Tongue flat, elongate, bifid at the end; scales never spinous.

† Limbs rudimentary, concealed beneath the skin; sides with a longitudinal fold. . . . . ANGUIDÆ, 72.

†† Limbs four—well developed.

‡ Scales of the belly rounded, arranged in quincunx order.
SCINCIDÆ, 74.

‡‡ Scales of the belly quadrate, arranged in cross-bands; throat with two cross-folds. . . . TEIDÆ, 73.

V. FAMILIES OF OPHIDIA.

* Both jaws fully provided with small teeth; no poison fangs; no rattle; no anal appendages; no ante-orbital pit; *not venomous.* . . . . COLUBRIDÆ, 75.

** Upper jaw with enlarged, erectile poison fangs, otherwise toothless; a deep pit between eye and nostril; *venomous.* CROTALIDÆ, 76.

*** Upper jaw with small, permanently erect poison fangs; no ante-orbital pit; color red, with black rings; somewhat *venomous.* . . . . . . ELAPIDÆ, 75. (b.)

ORDER T.—TESTUDINATA.

(*The Turtles.*)

Reptiles with the body enclosed between two more or less developed bony shields, which are usually covered by horny epidermal plates, but sometimes (*Trionychidæ*, *Sphargididæ*) by a leathery skin. The carapace (upper shield) and plastron (lower shield) are more or less united along the sides. The neck and the tail are the only flexible parts of the spinal column, and these, together with the legs, can usually be retracted within the box made by the two shields. The bony part of the carapace is formed by the dorsal and sacral vertebræ, and the ribs co-ossified with a series of overlying bony plates, usually accompanied by a marginal row. The dorsal vertebræ have their ends flattened and immovably united by cartilage, and all of them, except the first and last, have their neural spines flattened horizontally so as to form the median line of plates. On either side of this series is a single row of ossified dermal plates overlying the ribs and corresponding in number to the developed ribs of which there are usually eight pairs.

No traces of a true sternum have been discovered (*Huxley*). The plastron consists of membrane bones, of which there are usually nine pieces — four pairs and a single symmetrical median piece. These correspond neither in number nor position with the overlying dermal plates.

The skull is more compact than that of the other Reptiles. There are no teeth, but the jaws are encased in horny sheaths, usually with sharp cutting edges; the eye is furnished with two lids and a nictitating membrane as in the Birds; the tympanic membrane is always present, although sometimes hidden by the skin. Respiration is effected by swallowing air.

The order *Testudinata* is divided by Prof. Agassiz into two sub-orders: — AMYDÆ, comprising the Land and Fresh Water Turtles, with retractile feet that may be used for walking; and CHELONII, the Sea Turtles, with flipper-like feet used chiefly for swimming. Of the latter, several species occur on our coast, but we here omit them.

FAMILY LXVI. — TESTUDINIDÆ.

(*The Land Tortoises.*)

Carapace strong, thick, ovate, generally very convex and falling off abruptly at both ends; caudal shields united into one; plastron very broad, covering the whole under surface, the anterior part sometimes movable on a transverse hinge. Legs and feet club-shaped; toes firmly bound together by the integument, only the blunt claws being exserted.

Herbivorous Turtles, entirely terrestrial, inhabiting the warmer parts of both continents; about twenty species are known.

1. XEROBATES, Ag. LAND TORTOISES.

1. ***X. polyphemus,*** Daud. "GOPHER." L. 15. S. States, N. to N. C.; burrows in the ground like a woodchuck.

FAMILY LXVII. — EMYDIDÆ.

(*The Pond Turtles.*)

Carapace ovate, broadest behind, the margin having a tendency to flare outward, highest near the middle, usually rather depressed, rarely strongly convex; plastron covering the whole under surface, its plates twelve in number; sometimes the anterior lobe (and rarely the posterior also) movable on a transverse hinge, enabling the animal to completely close the shell. Toes broadly webbed in the aquatic species; scarcely webbed in the others. Jaws never hooked and pointed, as in allied families. They feed largely upon animals, but they rarely catch active prey. They do not bite except under much provocation. Species seventy or eighty, widely distributed, inhabiting marshes, ponds, and the shores of still streams; a few are strictly terrestrial.

* Carapace short, very high and strongly convex; plastron united to the carapace by a more or less cartilaginous suture and divided by a transverse hinge into two or more movable pieces; the anterior one, the smaller; toes scarcely webbed; terrestrial. . . . . CISTUDO, 1.

** Carapace somewhat elongated, considerably arched; plastron immovable; toes short, with a small web; feet more nearly equal, and habits less aquatic than in the succeeding groups; species of small size.

a. Shell more or less carinated, without round spots; upper jaw deeply notched and arched downward. . CHELOPUS, 2.

aa. Shell not carinated, black, usually with round, yellowish spots; upper jaw slightly notched, its edges nearly straight. NANEMYS, 3.

*** Carapace rather depressed; plastron wide, flat, movable upon the carapace and also upon a transverse hinge; anterior lobe somewhat smaller than the posterior, which is emarginate behind; toes webbed. . . . . EMYS, 4

**** Carapace rather flat; plastron wide and flat, as is also the bridge connecting it to the carapace; toes broadly webbed; hind-legs much stouter than fore-legs; larger species, decidedly aquatic.

† Upper jaw not notched in front; carapace more or less strongly keeled or tuberculated. . . . MALACOCLEMMYS, 6.

†† Upper jaw notched in front; shell not keeled in adult.

‡ Horizontal alveolar surfaces of jaws not divided by a longitudinal ridge; stripes on neck, tail, legs, etc., bright red (in our species); head with yellow lines; large plates of carapace plain; marginal plates with bright red markings; a small tooth on each side of notch in upper jaw; shell never keeled. . . . . . CHRYSEMYS, 5.

‡‡ Horizontal alveolar surfaces divided by a longitudinal ridge, running parallel with the cutting edge; stripes on legs, etc., usually yellow, never bright red; large plates of carapace often variegated; traces of a keel usually evident, at least in the young. . . PSEUDEMYS, 7.

1. *CISTUDO,* Fleming. BOX TURTLES.

1. ***C. carolina,*** (L.) COMMON BOX TURTLE. Colors very variable, chiefly blackish variegated with yellowish; N. Y. to Mo. and S. in dry woods.

Var. ***triunguis,*** (Ag.) Cope. THREE-TOED BOX TURTLE. Hind-feet mostly 3-toed, paler. Southern, N. to Penn.

2. ***C. ornata,*** Ag. NORTHERN BOX TURTLE. "Shell round, broad, flat, without keel, even when young." Iowa and W.

2. *CHELOPUS,* Rafinesque. WOOD TURTLES.

* A deep notch in upper jaw, with a lengthened tooth on each side of it; lower jaw strongly arched upwards. (*Calemys*, Ag.)

1. ***C. muhlenbergii,*** (Schweigger) Cope. MUHLENBERG'S TORTOISE. Brown with yellowish markings; plastron black with yellowish central blotch; an orange spot on each side of neck; shell somewhat carinated; L. 4½. E. Penn. and N. J.

** Upper jaw broad at end, arched downward, with a notch at tip; just behind the tip the horny sheath slants inward so that the width of the jaw is less than that of the forehead; edge of lower jaw straight, excepting the tip which is strongly upcurved. (*Glyptemys*, Ag.)

2. ***C. insculptus,*** Le C. WOOD TORTOISE. Shell carinated, its plates marked with concentric striæ and radiating lines; plastron with a black blotch on each plate; L. 8. U. S., E. of Ohio, in woods and fields.

3. *NANEMYS,* Agassiz. SPECKLED TORTOISES.

1. ***N. guttatus,*** (Schn.) Ag. SPECKLED TORTOISE. Black, dotted more or less with orange, these spots rarely obsolete; plastron yellow, blotched with black; shell not carinated; L. 4½. E. U. S., W. to N. Ind. (*Levette*); abundant.

4. *EMYS,* Brogniart. TORTOISES.

1. ***E. meleagris,*** (Shaw) Ag. BLANDING'S TORTOISE. Jet black; usually with yellowish spots; plastron yellowish with black blotches; head with yellow spots; L. 8. Wisconsin to Alleghanies, in moist woods and fields.

5. *CHRYSEMYS,* Gray. PAINTED TURTLES.

1. ***C. picta,*** (Herm.) Ag. PAINTED TURTLE. MUD TURTLE. Greenish black; plates margined with paler; marginal plates marked with bright red; plastron yellow, often blotched with brown; L. 8. E. U. S., one of the most common turtles.

2. ***C. marginata,*** Ag. Plates of carapace alternating or in quincunx, the lateral rows out of line with the

middle one, instead of forming sets of three as in the eastern form; lateral plates with strong concentric striæ. W. N. Y. and W., common. *C. oregonensis*, (Holb.) Ag., without red markings, occurs in Minn. and W.

6. MALACOCLEMMYS, Gray. MARSH TURTLES.

* Lower jaw spread out into a spoon-shaped dilatation; head with a horny skin; inland turtles. (*Graptemys*, Ag.)

1. **M. geographicus,** (LeS.) Cope. MAP TURTLE. Dark olive brown with greenish and yellow streaks and reticulations, especially distinct on neck, legs and edges of carapace; plastron yellowish; carapace strongly notched behind and usually decidedly keeled. Miss. Valley, E. to N. Y.

2. **M. lesueuri,** (Gray) True. LESUEUR'S MAP TURTLE. Much like the preceding but grayer, the markings on the shell paler, less distinct and in larger pattern; keel of carapace stronger, each plate of the vertebral series with a blackish projection behind, which is more or less imbricated over the succeeding plate; plastron yellowish, marbled with blackish; head, neck and legs with bright yellow stripes. Wis. to Ohio and S. W.

** Sheath of jaws straight, the cutting edges smooth; salt-marsh turtles. (*Malacoclemmys.*)

3. **M. palustris,** (Gmel.) SALT-MARSH TURTLE. DIAMOND-BACK. Greenish or dark olive; plates, both of carapace and plastron, with concentric dark stripes. N. Y. to Texas, along the coast.

7. PSEUDEMYS, Gray. TERRAPINS.

* Jaws serrated. (*Ptychemys*, Ag.)

1. **P. rugosa,** (Shaw). RED-BELLIED TERRAPIN. Dusky, with red markings above; marginal plates with much red; plastron red or partly yellowish; neck, etc., with

yellow stripes; variable; N. J. to Va., an elegant turtle, known by the serrated jaws.

** Jaws not serrated. (*Trachemys*, Ag.)

2. ***P. hieroglyphica,*** (Holbr.) HIEROGLYPHIC TURTLE. Shell smooth, depressed; olive brown with broad reticulated, yellowish lines; plastron dingy yellow; head very small. E. U. S.

3. ***P. troostii,*** (Holbr.) YELLOW-BELLIED TERRAPIN. Greenish-black, lateral plates with horn-colored lines and spots; plastron dull yellow, with large, black blotches; throat with greenish stripes; shell never keeled. Miss. Valley, N. to Ills.

4. ***P. elegans,*** (Wied.) ELEGANT TERRAPIN. Brown with yellowish wavy lines and blotches; a blood-red band on each side of neck; plastron yellow with a dusty blotch on each plate. Ills. to Rocky Mountains.

5. ***P. scabra,*** (L.) Cope. ROUGH TERRAPIN. Dark brown, with yellow stripes; plastron yellow with small black blotches in front; carapace wrinkled. Va. to Fla.

FAMILY LXVIII.—CINOSTERNIDÆ.

(*The Cinosternoid Turtles.*)

Carapace rather long and narrow, the outline usually rising gradually from the front to a point beyond the center of the shell, then abruptly descending; the bulk of the body therefore thrown backward; margin of the carapace turning downward and inward rather than outward; plastron proportionally large, covered with 7, 9 or 11 horny plates, the anterior pair coalescing into one; anterior, and sometimes also posterior lobe of plastron, often movable upon the fixed central portion; head pointed; jaws usually strong.

Turtles of small size, chiefly American.

* Anterior and posterior lobes of plastron nearly equal, both freely movable and capable of closing the shell; posterior lobe emarginate behind, its angles rounded; carapace without traces of keel in adult. . . . . CINOSTERNUM, 1.

** Posterior lobe of plastron narrower and longer, truncate behind, its angles rather pointed; lobes of plastron little movable, incapable of closing the shell; carapace more or less carinated, at least when young; head very large, with strong jaws. AROMOCHELYS, 2.

1. CINOSTERNUM, Wagler. SMALL BOX TURTLES.

> *Thrynosternum*, Ag.

1. ***C. pennsylvanicum,*** (Bosc.) Bell. SMALL MUD TURTLE. Shell dusky brown; head and neck with light stripes and yellow dots; anterior dorsal plate nearly as broad in front as long; L. 4. N. Y. to Fla. and W.

2. AROMOCHELYS, Gray. MUSK TURTLES.

= *Ozotheca*, Agassiz.

1. ***A. odoratus,*** (Latreille) Gray. MUSK TURTLE. STINK-POT. Shell dusky, clouded, sometimes spotted; head very large with strong jaws; carapace with traces of a keel, but the plates not imbricated in the adult; anterior dorsal plate nearly twice as wide as long in front; a yellow stripe from snout, above eye, down the side of neck and another below eye; a strong musky odor; L. 6. E. U. S., abundant. W. to Indiana. (*Levette.*)

2. ***A. carinatus,*** Gray. LITTLE MUSK TURTLE. Plates of carapace overlapping more or less, each one edged with black and marked with radiating stripes; neck unstriped. Lower Mississippi region. (*Goniochelys minor*, Ag.)

FAMILY LXIX. — CHELYDRIDÆ.

(*The Snapping Turtles.*)

Shell high in front, low behind; bulk of body thrown forward; head and neck very large; jaws strongly hooked, and exceedingly powerful; tail long, strong, with a crest of horny, compressed tubercles; plastron small, cross-shaped, covered with twelve plates; bridge very narrow.

Large turtles of great strength and voracity, chiefly aquatic; two of the three species are American, the third (*Platysternum*) is from China. Their fierceness is well known; when angry they elevate the body, and, in biting, throw themselves forcibly forward.

* Head rough, covered with soft skin; tail with two rows of large scales beneath; ridges of carapace disappearing with age; jaws moderately hooked. . . . CHELYDRA, 1.

** Head very large, covered with smooth, symmetrical plates; tail with many small imbricate scales beneath; carapace very strongly three-keeled; jaws very strongly hooked. MACROCHELYS, 2.

1. CHELYDRA, Schweigger. SNAPPING TURTLES.

1. ***C. serpentina,*** (L.) Schw. COMMON SNAPPING TURTLE. Canada to Equador, every where abundant.

2. MACROCHELYS, Gray. ALLIGATOR SNAPPERS.

= *Gypochelys*, Ag.

1. ***M. lacertina,*** (Schw.) MISSISSIPPI SNAPPER. Gulf States, N. to Illinois; "perhaps the most ferocious, and, for their size, the strongest of reptiles."

FAMILY LXX.—TRIONYCHIDÆ.

(*The Soft-Shelled Turtles.*)

Body flat, nearly orbicular; carapace not completely ossified, the ribs projecting freely towards the outer extremities; marginal ossicles rudimentary; carapace and plastron covered by a thick leathery skin which is flexible at the margins. Head long and pointed with a long, flexible, tubular, pig-like snout; neck long. Feet broadly webbed; toes long, 5–5, but the claws only 3–3.

Aquatic, carnivorous and voracious; species about 30, in both hemispheres.

* Nostrils terminal, crescent-shaped; a prominent longitudinal ridge projecting from each side of septum. ASPIDONECTES, 1.

** Nostrils rather under the tip of snout; nasal septum without an internal longitudinal ridge on each side. AMYDA, 2.

1. ***ASPIDONECTES,*** Wagler. SOFT-SHELLED TURTLES.

1. ***A. spinifer,*** (LeSueur) Ag. COMMON SOFT-SHELLED TURTLE. Carapace olive brown with dark spots; plastron nearly white; head and neck olive green with light and dark stripes; legs and feet mottled every where with dark; male with the tubercles on the front of the carapace smaller than in the female, the body also longer and the tail extending considerably beyond the margin of the carapace. Great Lakes and Upper Mississippi, abundant.

2. ***A. nuchalis,*** Ag. CUMBERLAND TURTLE. A marked depression on either side of the keel, which is dilated and triangular anteriorly; spines and tubercles on carapace largely developed. Cumberland and Upper Tenn. Rivers.

2. ***AMYDA,*** Agassiz. LEATHERY TURTLES.

1. ***A. mutica,*** (Les.) Ag. LEATHERY TURTLE. A depression along median line of carapace; no spines nor tubercles along anterior margin nor on back; feet not mottled below. Upper Mississippi and Great Lakes.

ORDER U.—LACERTILIA.

(The Lizards.)

Reptiles not shielded, with the body usually covered with overlapping scales; mouth not dilatable; tongue free; jaws always with teeth. Limbs four, distinct, rarely rudimentary and hidden by the skin; a pectoral arch developed. Feet usually with five digits, the phalanges normally 2, 3, 4, 5, 3 or 4. Tail usually long and in many cases very brittle, readily broken by a slight blow; this is owing to a thin, unossified, transverse septum, which traverses each vertebra. "The vertebra naturally breaks with great readiness through the plane of the septum, and when such lizards are seized by the tail, that appendage is pretty certain to part at one of these weak points" (*Huxley*). Vent a cross slit; urinary bladder present. The great majority of the numerous species belong to tropical and subtropical regions.

FAMILY LXXI.—IGUANIDÆ.

(*The Iguanas.*)

New World lizards of various habits; the tongue short and thick and the eyes diurnal with round pupils; scales imbricated, those on the belly small and rhombic. Feet for walking; toes unequal. Tail with more or less distinct whorls of scales, which are commonly spinous. Warmer parts of America. Genera about sixty; species one hundred and fifty, or more. (*Gray.*)

* Body moderately depressed; head broad, not spinous; ventral plates not keeled. . . . . . . SCELOPORUS, 1.

** Body much depressed; head armed with stout spines. PHRYNOSOMA, 2.

1. SCELOPORUS, Wiegmann. TREE SWIFTS.

= *Tropidolepis*, Cuvier.

1. ***S. undulatus***, (Harlan) PINE TREE LIZARD. SWIFT. Greenish, bluish, or bronzed, with black, wavy cross bands above; throat and sides of belly usually with

brilliant blue or green; dorsal scales rather large, carinated; tail slender; L. 7. U. S., in pine forests, etc.; abundant southward; varies greatly in color.

2. PHRYNOSOMA, Wiegmann. HORNED TOADS.

1. ***P. douglasi,*** Bell. HORNED TOAD. TEGUEXIN. No row of large spines along sides of belly; ventral scales smooth. Central and Western parts of U. S. southwestward occurs *P. cornutum* (Harlan) Gray, with a row of stout lateral spines, and carinated ventral plates.

FAMILY LXXII.—ANGUIDÆ.

(*The Glass Snakes.*)

Limbs rudimentary, hidden under the skin; body, therefore, snake-like in form, but the general aspect lizard-like.

1. OPHEOSAURUS, Daudin. GLASS SNAKES.

1. ***O. ventralis,*** (L.) Daud. GLASS SNAKE. Body serpentiform; a conspicuous lateral fold; no external limbs; tail very brittle, as in most lizards; dusky and yellow with narrow black streaks. Tenn. to Kansas and S.

FAMILY LXXIII.—TEIDÆ.

(*The Teguexins.*)

New World Lizards; head pyramidal, with regular many-sided shields; scales of back granular or carinated; throat scaly, usually with a double collar. Warmer parts of America; genera 12; species about 40.

1. CNEMIDOPHORUS, Wiegmann. TARAGUIRAS.

1. ***C. sexlineatus,*** (L.) D. & B. SIX-LINED LIZARD. Olive, with 3 or 4 yellow streaks on each side; abdomen

silvery; length 6 to 9 inches. S. E. Va. to Ills. and Mexico.

FAMILY LXXIV.—SCINCIDÆ.

(*The Skinks.*)

Head subquadrangular; regularly shielded; body fusiform or subcylindrical, often with longitudinal stripes; limbs 4, various. Genera 50; species 150; in most parts of the world.

* Ear large; its front edge dentate; lower eye-lid scaly. EUMECES, 1.

** Ear very large, circular, its front edge rounded; lower eye-lid with a transparent disk. . . . . OLIGOSOMA, 2.

1. ***EUMECES,*** Wiegmann. BLUE TAILS.

= *Plestiodon*, Auct.

1. ***E. fasciatus,*** (L.) BLUE-TAILED LIZARD. Blackish, with five yellowish streaks, middle one forked on the head; tail mostly blue; old specimens sometimes reddish olive, obscurely striped; head reddish; L. 8 to 11. U. S., E. of the Rocky Mts.; abundant S.; very variable.

2. ***E. septentrionalis,*** (Baird) Cope. NORTHERN SKINK. Olive, with four dark stripes above; sides with two narrow white lines margined on each side with black. Minnesota to Nebraska.

3. ***E. anthracinus,*** (Baird) Cope. Four yellow stripes, between and below which are black lines. Penn. S. to Texas.

2. ***OLIGOSOMA,*** Girard. MOCOS.

1. ***O. laterale,*** (Say) Grd. GROUND LIZARD. Chestnut color; on each side a black lateral band, edged with white; abdomen yellowish; tail blue below; head short; small and slender; L. 5. Southern States, abundant; N. to Illinois. (*Nelson.*)

ORDER V.—OPHIDIA.

(*The Serpents.*)

Reptiles, not shielded, with an epidermal covering of imbricated scales, which is shed as a whole and replaced at regular intervals. Mouth very dilatable, the bones of the lower jaw separate from each other, only united by ligaments. Limbs wanting, or represented by small spurs on the sides of the vent; vent a transverse slit. Various anatomical characters distinguish the snakes, but the elongated form and absence of limbs separate them at once from all our other Vertebrates, excepting the Lizard *Opheosaurus*, and this is not in any other respect, snake-like.

FAMILY LXXV. (*a*)—COLUBRIDÆ.

(*The Colubrine Snakes.*)

Both jaws fully provided with teeth, which are conical and not grooved; head covered with shields; no poison fangs; no spur-like appendages to vent; belly covered with broad band-like plates (gastrosteges); tail conical, tapering; sub-caudal plates (urosteges) arranged in pairs.

A very large family comprising nearly one hundred genera, and upwards of four hundred species, found in nearly every part of the world, but most abundant in warm regions. They differ from the *Elapidæ* of the Southern U. S. and southward, in the want of erect poison fangs; from the *Crotalidæ*, in having both jaws fully provided with teeth, and the absence of erectile poison fangs; and from the *Boidæ* and their relatives in the want of the spur-like rudimentary posterior limbs.

The following key is entirely artificial, and in the consideration of the species, I have generally omitted characters taken from the *cephalic* plates as not available for my purpose.

* Dorsal scales carinated.

† Anal plate entire.

a. Rows of scales 19 to 21; ventral plates (gastrosteges) 140 to 170; general color 3 light stripes on a darker ground; sides usually with spots; mostly viviparous. EUTÆNIA, 5.

aa. Rows of scales 29 to 37; gastrosteges 200 to 240; general color whitish with a triple series of dark blotches. PITYOPHIS, 7.

†† Anal plate bifid.

b. Rows of scales 15 to 17.

c. Tail about one-third of total length; gastrosteges 150 to 160; urosteges 100 or more; color clear golden green. PHYLLOPHILOPHIS, 9.

cc. Tail much less than one-third of total length; gastrosteges 125 to 130; urosteges 60 or less; color brown or reddish.

d. With one or two faint grayish dorsal stripes and usually a broken dusky band along sides; small species: rows of scales 15 to 17; loral plate absent; anteorbital present. . . . STORERIA, 4.

dd. No dorsal stripe; rows of scales 17; loral plate present; anteorbital wanting. . HALDEA, 16.

bb. Rows of scales 19 to 21.

e. Gastrosteges 130 to 170; general color usually 3 or more dark bands on a lighter ground; size large. TROPIDONOTUS, 2.

ee. Gastrosteges 130 to 140; general color brown with many obscure black cross-blotches, distinct on neck; belly salmon red with a row of black spots on each side; size small. . . . . TROPIDOCLONIUM, 3.

bbb. Rows of scales 23 to 29.

f. Form short and stout; snout prominent, acute, recurved and keeled, forming a sharp ridge; head flattened when angry; gastrosteges 125 to 150. HETERODON, 1.

ff. Snout not recurved and keeled; species of large size.

g. Gastrosteges 130 to 155; general color 3 series of dark blotches on a lighter ground, sometimes simply barred or uniformly dark or reddish; aquatic. TROPIDONOTUS, 2.

gg. Gastrosteges 200 to 235; general color brown or black, sometimes with quadrate blotches; abdomen usually blotched; terrestrial. . . . COLUBER, 8.

** Dorsal scales smooth.

‡ Anal plate entire; gastrosteges 175 to 200· color black, brown or red, more or less variegated.

h. Rows of scales 21 to 25; loral plate present. OPHIBOLUS, 12.

hh. Rows of scales 19; no loral plate. . . OSCEOLA, 13.

‡‡ Anal plate bifid; scales in 13 to 17 rows.

i. Gastrosteges 170 to 210; scales in 17 rows; snakes very large or very long — ours lustrous pitch black in color when adult. . : . . . BASCANIUM. 6.

ii. Gastrosteges less than 170; snakes of medium to small size.

j. Scales in 13 rows; gastrosteges 120 to 135; brown, salmon color or yellowish beneath. . CARPHOPHIOPS, 18.

jj. Scales in 15 to 17 rows.

k. Color black, unstriped; a distinct yellowish ring about neck; gastrosteges 140 to 160. . DIADOPHIS, 11.

kk. Color clear bright green; no collar; gastrosteges 130 to 140. . . . . . . CYCLOPHIS, 10.

kkk. Color brownish, with black dots; no collar; gastrosteges 115 to 125. . . . . . VIRGINIA, 17.

‡‡‡ Anal plate bifid; scales in 19 rows; gastrosteges, 170 to 185.

l. Bluish black with squarish red spots on the blanks; abdomen red with black spots. . . . . FARANCIA, 14.

ll. Blue-black, with three red lines; abdomen yellowish with a series of dark spots. . . . . ABASTOR, 15.

1. HETERODON, Beauvais. SPREADING ADDERS.

1. ***H. platyrhinus,*** Latreille. BLOWING VIPER. HOG-

NOSE SNAKE. Brownish, with about 28 dark dorsal blotches, besides lateral ones and half rings on the tail; sometimes uniform black. Vertical plate longer than broad, about equal to occipitals; L. 30; G. 125 to 150; scales 25. E. U. S., abundant. A very variable species; when angry it depresses and expands the head, hissing furiously, thus exhibiting a very threatening appearance, but it is perfectly harmless.

2. ***H. simus,*** (L.) Holbrook. HOG-NOSED SNAKE. Dorsal blotches about 35; ground color usually paler or yellowish brown; vertical plate much longer than occipitals, broader than long; G. 130; scales 23 to 27, usually 25. Southern, N. to Ills. and Wis.

2. *TROPIDONOTUS,* Kuhl. WATER SNAKES.

* Scales in 23 to 29 rows. (*Nerodia*, B. & G.)

1. ***T. sipedon,*** (L.) Holbr. WATER SNAKE. WATER ADDER. Brownish; back and sides with each a series of large, square, dark blotches alternating with each other; rarely uniformly dusky; scales 23; G. 130 to 150; L. 30 to 50. E. U. S., abundant; aquatic.

Var. ***erythrogaster,*** (Shaw) Cope. RED-BELLIED WATER SNAKE. Uniform red-black above; copper-color below; head elongated. Michigan to Kansas and S.

Var. ***woodhousei,*** (B. & G.) Cope. Scales in 25 rows. Mo. to Texas.

2. ***T. rhombifer,*** Hallowell. HOLBROOK'S WATER SNAKE. Brown, with black quadrangular blotches; scales in 27 rows. Mich., Ills. and S.

** Scales in 19 to 21 rows. (*Regina*, B. & G.)

3. ***T. rigidus,*** (Say) Holbr. STIFF SNAKE. Greenish brown; two brown dorsal bands; abdomen yellowish, spotted; outer row of scales smooth; scales 19; G. 130 to 170; L. 24. Penn. to Ga.

4. ***T. leberis,*** (L.) Holbr. LEATHER SNAKE. Chestnut brown; a yellow lateral band and three narrow black dorsal stripes; scales all carinated; scales 19; G. 140 to 150; L. 24. U. S., chiefly eastward.

5. ***T. grahami,*** (B. & G.) Cope. GRAHAM'S SNAKE. Brown; a broad yellowish lateral band; scales all strongly carinated; head slender; abdomen unspotted; scales 19 (to 21?); G. 160; L. 20. Mississippi Valley, N. to Michigan.

3. *TROPIDOCLONIUM,* Cope. LITTLE RED SNAKES.

1. ***T. kirtlandi,*** (Kenn.) Cope. KIRTLAND'S SNAKE. Head shiny black; vertical plate broad; scales 19, all carinated; G. 115 to 140; L. 8. Ohio to Ill.; a handsome little snake.

4. *STORERIA,* Baird and Girard. RED-BELLIED SNAKES. = *Ischnognathus*, Dum. & Bibron.

1. ***S. occipitomaculata,*** (Storer) B. & G. RED-BELLIED SNAKE. Grayish or chestnut brown, usually showing a paler vertebral band bordered by blackish dots; obscure dots on side; occiput with three pale blotches (very constant); belly salmon red; scales 15; G. 120 to 125; L. 12. U. S., chiefly eastward; abundant.

2. ***S. dekayi,*** (Holbr.) B. & G. DEKAY'S BROWN SNAKE. Grayish brown; a clay-colored dorsal band, bordered by dotted lines; grayish below; body thickish, tapering towards the small head; scales 17; G. 125 to 130; L. 12. E. U. S.

5. *EUTÆNIA,* Baird and Girard. GARTER SNAKES.

* Body very slender, elongated; tail nearly one-third of total length; scales in 19 rows.

1. ***E. saurita,*** (L.) B. & G. RIBAND SNAKE. SWIFT

GARTER SNAKE. Brown with three yellow stripes; light, clear brown, below the lateral stripes; tail usually more than $\frac{1}{3}$ of length; colors bright; G. 150 to 160; L. 36. U. S., chiefly E. of the Alleghanies.

2. ***E. faireyi,*** B. & G. FAIRIE'S GARTER SNAKE. Blackish, with three greenish yellow stripes; body relatively stout; tail less than $\frac{1}{3}$ length; space below bands same color as above; G. 165 to 180; L. 30. Miss. Valley, N. to Wis.

3. ***E. proxima,*** (Say) B. & G. SAY'S GARTER SNAKE. Blackish, dorsal stripe brownish yellow; lateral stripes greenish; tail $\frac{2}{7}$ of total length; sides colored like back; G. 165 to 175; L. 35. Miss. Valley, N. to Wis.

** Body stouter; tail shorter, about $\frac{1}{4}$ of total length; scales 19.

4. ***E. radix,*** Baird & Girard. HOY'S GARTER SNAKE. Black with three narrow yellow lines; scales very rough, the outer row broad; colors deep; head short; G. 150 to 160; L. 25. L. Michigan to Oregon.

5. ***E. sirtalis,*** (L.) B. & G. COMMON GARTER SNAKE. STRIPED SNAKE. Olivaceous, dorsal stripe narrow; lateral stripes rather broad but not conspicuous; colors generally duller than in the other species, lateral rows of spots more or less distinct; G. 130 to 160. N. Am., every where; our commonest snake; very variable. Prominent varieties are:

Var. ***ordinata,*** (L.) Cope, has the stripes duller and the spots more distinct, 85 in number. Chiefly northeastward.

Var. ***dorsalis,*** (B. & G.) Cope, has the dorsal stripe broad, and a row of distinct spots above the lateral stripe. N. Am., every where.

Var. ***parietalis,*** (Say) Cope, has the stripes dull greenish and the spaces between the lateral spots vivid brick red. Ind. (*Jordan*) and W.

6. BASCANIUM, Baird and Girard. BLACK SNAKES.

> *Coryphodon*, Dumeril et Bibron.

1. **B. constrictor,** (L.) B. & G. BLACK SNAKE. Lustrous pitch black, greenish below, chin and throat white; young olive with rhomboid blotches; large, rather slender; scales 17 (rarely 19); G. 170 to 200; L. 50 to 60. E. U. S., common E. and S.

7. PITYOPHIS, Holbrook. PINE SNAKES.

1. **P. melanoleucus,** (Daud.) Holb. PINE SNAKE. BULL SNAKE. White, with chestnut brown blotches which are margined with black, besides other markings; scales 29; G. 220 to 230; L. 60. Pine woods; N. J. to Ohio and southward.

2. **P. sayi,** (Schlegel) B. & G. WESTERN PINE SNAKE. Whitish or reddish, with many dark blotches and spots; scales usually 25; G. 220 to 230; L. 40 to 70. Western, E. to Wis

8. COLUBER, Linnæus. RACERS.

> *Scotophis*, B. & G.

1. **C. guttatus,** L. SPOTTED RACER. Red brown with a dorsal series of large, red, dark-edged blotches; belly checkered with black; scales 27; G. 210 to 230; L. 50. Virginia and S.

2. **C. obsoletus,** Say. PILOT SNAKE. RACER. Lustrous black, some scales white-edged; vertical plate longer than broad; scales 27; G. 235; L. 50 to 75. Mass. to Ills. and Texas; one of our largest snakes. (*C. alleghaniensis*, Holbr.)

3. ***C. vulpinus,*** (B. & G.) Cope. Fox Snake. Light brown, with quadrate, chocolate-colored blotches; vertical plate broader than long; scales 25; G. 200 to 210; L. 60. Mass. to Kansas and Northward.

4. ***C. emoryi,*** (B. & G.) Cope. Emory's Racer. Ashy gray with transverse brown blotches; vertical plate elongated; 6 or 8 median rows of scales only carinated; scales 29; G. 210 to 220; L. 40 to 50. Ills. to Kansas and Texas.

9. ***PHYLLOPHILOPHIS,*** Garman. Summer Snakes.

1. ***P. æstivus,*** (L.) Garman. Summer Green Snake. Head conical, neck very small; bright clear green, yellowish below; scales 17; G. 150 to 160; L. 30. Southern, N. to N. J. and Ills., abundant in the mountains; a most exquisite little creature.

10. ***CYCLOPHIS,*** Günther. Green Snakes.

1. ***C. vernalis,*** (DeKay.) Green Snake. Grass Snake. Spring Snake. Head elongate, neck slender, eyes very large; uniform deep green (bluish in spirits), yellowish below; scales 15; G. 130 to 140; L. 20. E. U. S., chiefly northerly; a beautiful species.

11. ***DIADOPHIS,*** Baird and Girard. Ring-Necked Snakes.

< *Ablabes*, D. & B.

1. ***D. punctatus,*** (L.) B. & G. Ring-Necked Snake. Head depressed; eye rather large; blue-black above, bright pale orange below (yellowish in spirits); each plate usually with a black spot; yellowish occipital ring conspicuous; scales 15; G. 140 to 160; L. 15. Whole U. S.

Var. **amabilis,** (B. & G.) Cope, is slender, with 180 or more gastrosteges; below darker and more spotted. Western, E. to Ohio.

2. **D. arnyi,** Kenn. Arny's Ring-Necked Snake. Lead black; belly spotted and mottled with black; occipital ring narrow, scales 17. Ills. to Kansas.

12. OPHIBOLUS, Baird and Girard. King Snakes.

< *Coronella*, Laurenti.

< *Lampropeltis*, Auct.

1. **O. getulus,** (L.) B. & G. Chain Snake. Thunder Snake. Black with narrow yellowish lines forking on the flanks, each fork embracing a large black spot; belly checkered; scales 21; G. 210 to 225; L. 50. Maryland to La., E. of the mountains; variable; represented westward by

Var. **sayi,** (Holbr.) Cope. King Snake. Lustrous black, many scales with a whitish spot in the center. Alleghany to Rocky Mts., abundant, N. to Ills.; a handsome species.

2. **O. doliatus,** (L.) B. & G. Red Snake. Corn Snake, etc. Red with twenty to twenty-five pairs of black rings, each set enclosing a yellowish one; head red; scales 21; G. 180 to 210; L. 30 to 50. Md. to Kansas and S.; exceedingly variable, running by degrees into the following variety, extremes of which bear little resemblance to the typical *doliatus*.

Var. **triangulus,** (Boie) Cope. Milk Snake. House Snake. Spotted Adder. Grayish, with three series of brown, rounded blotches bordered with black, about fifty of them in the dorsal row; an arrow-shaped occipital spot; scales, etc., as in preceding. Va. to Iowa, and northward; very common. [*Coronella eximia*, (DeKay) Jan.]

3. ***O. calligaster,*** (Say) Cope. Kennicott's Chain Snake. Light olive gray, with about sixty quadrate, chestnut colored, emarginate blotches on back and two rows of smaller ones on each side; scales in 25 rows. Ills. to Kansas. (*O. evansi*, Kenn.)

13. OSCEOLA, Baird and Girard. Scarlet Snakes.

1. ***O. elapsoidea,*** (Holbr.) B. & G. Scarlet Snake. Brilliant red, with about fifteen pairs of jet black rings on body and three on tail, each pair enclosing a white ring; the black rings tapering towards the sides, the white ones spreading; resembles closely *O. doliatus*; scales 19; G. 175 to 180; L. 20. Va. to Fla.

14. FARANCIA, Gray. Horn Snakes.

< *Calopisma*, D. & B.

1. ***F. abacura,*** (Holb.) B. & G. Red-Bellied Horn Snake. Blue-black with red lateral spots; eyes small; scales 19; G. 175; L. 36. Southern, N. to Ills. (*Nelson.*)

15. ABASTOR, Gray. Red-Sided Snakes.

1. ***A. erythrogrammus,*** (Daudin) Gray. Red-Lined Snake. Blue-black; sides with three red lines; eyes very large; nostrils in the middle of nasal plate; scales 19; G. 180; L. 25. Southern, N. to Ills. (*Nelson.*)

16. HALDEA, Baird & Girard. Brown Snakes.

= *Conocephalus*, D. & B.

1. ***H. striatula,*** (L.) B. & G. Brown Snake. Head

elongated, on a small neck; reddish gray, salmon red beneath; scales 17; G. 125 to 130; L. 10. Va. to Texas.

17. VIRGINIA, Baird and Girard. BROWN SNAKES.

1. ***V. valeriæ,*** B. & G. VALERIA BLANEY'S SNAKE. Head elliptical; body slender; brownish with minute black dots, often in two rows; yellowish beneath; scales 15; G. 120 to 130; L. 12. Md. to Ills. and S.

2. ***V. elegans,*** Kenn. KENNICOTT'S BROWN SNAKE. Scales much narrower; uniform olivaceous above; yellowish beneath; scales 17. S. Ills. to Ark.

18. CARPHOPHIOPS, Gervais. WORM SNAKES.
= *Celuta*, B. & G.

1. ***C. amœnus,*** (Say) Cope. GROUND SNAKE. Glossy chestnut brown; belly salmon-red; head very small; vertical plate broad; nasal plate large, pierced by the nostril; scales 13; G. 120 to 130; L. 12. Mass. to Ills. and S.

2. ***C. helenæ,*** (Kenn.) Cope. HELEN TENNISON'S SNAKE. Lustrous chestnut-brown, flesh color beneath; snout short and narrow; a single pair of frontal plates; scales 13. S. Ills. to Miss.

3. ***C. vermis,*** (Kenn.) Cope. WORM SNAKE. Purplish-black, two pairs of frontals, as in *C. amœnus;* belly flesh color, color extending on sides; scales 13; larger than the others. Missouri to Kansas.

FAMILY LXXV. (*b.*)—ELAPIDÆ.

(*The Harlequin Snakes.*)

Venomous snakes, provided with two or more permanently erect, grooved fangs in the upper jaw, and usually a series of smaller teeth behind them; scales not carinated; head usually quadrangular, with flat crown and short muzzle; no loral plate. Genera 15; species about 50, chiefly East Indian, a few inhabiting the warmer parts of America.

* Anal plate entire; urosteges two-rowed; scales in 15 rows. Elaps, 1.

1. **ELAPS,** Schneider. Harlequin Snakes.

1. ***E. fulvius,*** (L.) Cuv. Bead Snake. Jet black, with about 17 broad crimson rings, each bordered with yellow, and spotted below with black; a yellow occipital band; tail with yellow rings; L. 30; G. 200 to 215; U. 32. Va. to Ark. and S. A beautiful snake, mild in disposition and apparently harmless, although provided with venom-fangs. Resembles *Osceola* and *Ophibolus.*

FAMILY LXXVI.—CROTALIDÆ.

(*The Crotalid Snakes.*)

Upper jaw destitute of solid teeth, but provided with an erectile, grooved poison-fang on each side in front; a deep pit between eye and nostril. Tail often provided with a rattle, composed of horny rings of modified epidermis. Urosteges generally undivided, at least anteriorly. Scales carinated in all our species. Species 50, more or less, all American, and renowned for the deadliness of their venom.

* Tail with a rattle.

† Top of head covered with small, scale-like plates, larger ones in front; size large; rattle large. . Crotalus, 1.

†† Top of head with 9 large plates; size small; rattle small. Caudisona, 2.

** Tail without a rattle; general color chestnut, variegated. Ancistrodon, 3.

1. **CROTALUS,** Linnæus. Rattlesnakes.

1. ***C. horridus,*** L. Banded or Northern Rattlesnake. Sulphur brown of various shades, with two rows

of confluent, brown, lozenge-shaped spots; tail black; a light loral line with a dark patch beneath; scales 23 to 25; G. 165 to 170; L. 40 to 60. U. S., chiefly eastward and southward, in rocky places; rapidly becoming extinct; several other species occur southwestward. (*C. durissus*, Auct.)

2. ***CAUDISONA,*** Laurenti. MASSASSAUGAS.

= *Crotalophorus*, Gray.

1. ***C. catenata*** (Raf.) MASSASSAUGA. PRAIRIE RATTLESNAKE. Brown or blackish with about seven series of deep chestnut blotches, sometimes entirely black; scales 25; G. 140 to 150; L. 30. Prairie region, E. to the Alleghanies; abundant in grassy fields where not exterminated.

3. ***ANCISTRODON,*** Beauvais. COPPERHEADS.

> *Toxicophis*, Troost.

< *Trigonocephalus*, Holbr., etc.

1. ***A. contortrix,*** (L.) B. & G. COPPERHEAD. Hazel brown; top of head bright coppery, back with a series of fifteen to twenty-five dark blotches having something the form of an inverted Y; yellowish below with dark blotches; scales 23; G. 150 to 160; L. 35 to 40. E. U. S., chiefly southerly.

2. ***A. atrofuscus,*** (Troost) B. & G. HIGHLAND MOCCASIN. COTTONMOUTH. Dusky above, with smoky gray blotches; tail black; belly white, blotched with black and minutely punctate; upper lip white; scales 25; G. 130 to 140; L. 25. Mts. of Tenn. and N. C. and South.

3. ***A. piscivorus,*** (Holbr.) Cope. WATER MOCCASIN. Greenish brown with dark vertical bars; scales 25; G. 140; L. 30. Aquatic; southern, probably not in our limits.

Class IV.—Batrachia.

(*The Batrachians.*)

Cold-blooded Vertebrates, allied to the fishes, but differing in several respects, notably in the absence of rayed fins, the limbs being usually developed and functional, with the skeletal elements of the limbs of Reptiles; toes usually without claws.

The Batrachians undergo a more or less complete metamorphosis; the young ("tadpoles") being aquatic and fish-like, breathing by means of external gills or branchiæ; later in life, lungs are developed and (excepting in *Proteida*) the gills disappear. Skin naked and moist (rarely having imbedded scales) and used to some extent as an organ of respiration. Heart with two auricles and a single ventricle.

Reproduction by means of eggs which are of comparatively small size, without hard shell, developed in water or in moist situations.

The Batrachians differ more from the Fishes in appearance than in reality, and they are sometimes combined into one group (*Ichthyopsida*), the Birds and Reptiles constituting another (*Sauropsida*).

ORDERS OF BATRACHIA.

* Body short, depressed; tail wanting in the adult; four developed limbs, the posterior being much enlarged. . ANURA, W.

** Body lengthened, with a distinct tail; hind limbs if present not specially elongated.

† With no external gills or branchiæ when adult; eyelids present. . . . . URODELA, X.

†† External branchiæ and gill clefts persistent through life; no eyelids. . . . . Proteida, Y.

W. FAMILIES OF ANURA.

* Fingers and toes tapering or cylindrical, not dilated into a disk at their tips.

† Upper jaw with teeth; toes completely webbed.

a. No spur at the heel; fingers often webbed; chiefly aquatic. Ranidæ, 77.

aa. One of the bones of the heel forming a sharp, flat-edged spur; fingers scarcely webbed; chiefly terrestrial. Scaphiopidæ, 78.

†† Jaws toothless; toes webbed; skin more or less warty; terrestrial. . . . . Bufonidæ, 80.

** Fingers and toes dilated at their tips, forming a viscous disk; arboreal. . . . . Hylidæ, 79.

X. FAMILIES OF URODELA.

* No spiracles or openings in the sides of the neck in the adult.

† Sides (in our species) with a row of round red or yellowish spots which are bordered with black (these very rarely obsolete); belly dotted with black; tarsus and carpus ossified; vertebræ opisthocœlian (not biconcave). Salamandridæ, 81.

†† Spots, if any, not as above.

‡ Carpus and tarsus cartilaginous; tongue much smaller and more extensively free than in the next.

a. Vertebræ concave behind only (opisthocœlian); teeth on parasphenoid (behind vomer). Desmognathidæ, 82.

aa. Vertebræ biconcave (amphicœlian); parasphenoid teeth present. Plethodontidæ, 83.

‡‡ Carpus and tarsus ossified; vertebræ amphicœlian; tongue large, thick, papillose, attached by its base, with a narrow free margin; salamanders usually of large size and dark colors; no teeth behind the cross band on vomer. Amblystomidæ, 84.

** With a spiracle or rounded opening in each side of the neck: size large.

b. Limbs well developed; toes 4–5. . . . Menopomidæ, 85.

bb. Limbs rudimentary; toes 2–2 or 3–3. . Amphiumidæ, 86.

Y. FAMILIES OF PROTEIDA.

* Hind legs present; both jaws with teeth; form salamander-like. PROTEIDÆ, 87.

** Hind legs wanting; upper jaw toothless; form eel-like. SIRENIDÆ, 88.

ORDER W.—ANURA.

(*The Tailless Batrachians.*)

Body nearly or quite naked, short and broad; all four limbs present; tail wanting in the adult; young (tadpole) fish-like, with broad head, external branchiæ, a long tail, no limbs and no teeth; the intestinal canal very long, adapted for a vegetable diet; from this form by degrees it develops into the adult animal which is always more or less Frog-like.

FAMILY LXXVII.—RANIDÆ.

(*The Frogs.*)

Tailless Batrachians with the tongue adherent in front and more or less free behind; fingers four, toes five, both commonly webbed; ear well developed, jaw and usually vomer, with teeth; chiefly aquatic. Genera fourteen, species about fifty; very abundant in tropical America.

* Vomerine teeth present; no finger opposed to the others; tongue nicked behind; toes full-webbed. . . RANA, 1.

1. *RANA,* Linnæus. FROGS.

* Back with large distinct spots arranged in more or less regular rows; back with two conspicuous yellowish folds.

1. ***R. virescens,*** Kalm. LEOPARD FROG. COMMON FROG. General color greenish, often bright, sometimes brassy, with many pale-edged dark spots which lie in two irregular rows on back; usually two large spots

between eyes; legs barred above; belly pearly or yellowish, each side of back with a well-marked fold. N. Am., the commonest species.

2. ***R. palustris,*** Le Conte. PICKEREL FROG. Brownish with the spots square, in four rows; young golden green; body with two glandular folds on each side; slender. E. U. S.

** Back with small dark spots or none.

3. ***R. clamitans,*** Merrem. GREEN FROG. SPRING FROG. Bright green, darker on the flanks, every where spotted with blackish; color sometimes rather brown than green; white below; glandular folds conspicuous; size moderate. U. S., E. of the mountains. (*R. horiconensis*, Holbr. *R. fontinalis*, Le C.)

4. ***R. catesbiana,*** Shaw. BULL FROG. Greenish, of varying shades, with numerous small, indistinct darker spots, head usually of a very bright pale green; glandular folds little marked; very large, a foot or more long when adult. E. U. S., common; well noted for its rich bass notes. (*R. pipiens*, Auct., not of L.)

5. ***R. silvatica,*** Le Conte. WOOD FROG. Color reddish brown; a dark band on each side of the head through eye and ear; quite small. E. U. S. common; scarcely aquatic. (R. *cantabrigensis*, Baird, the Cambridge frog, from E. Mass., N. and W. is another variety of this species.) (See Addenda.)

FAMILY LXXVIII.—SCAPHIOPIDÆ.

(*The Spade Foots.*)

Terrestrial frogs having the heel provided with a more or less developed spur. Genera three; species ten or more. In Europe, America, and Australia.

* Toes completely webbed; forehead and crown bony, rough; skin slightly tuberculate. . . SCAPHIOPUS, 1.

1. **SCAPHIOPUS,** Holbrook. SPADE FOOTS.

1. ***S. holbrookii,*** (Harlan) Baird. SOLITARY SPADE FOOT. Heel with a sharp-edged spur; olive brown, a pale yellow streak on each side. E. U. S., not very common; burrows in the ground. (*S. solitarius*, Holbr.)

FAMILY LXXIX.—HYLIDÆ.

(*The Tree Frogs.*)

Arboreal frogs of small size, having the fingers and toes more or less dilated into disks at their tips; ear well developed. Genera ten; species sixty; found in most parts of the world; noted for their shrill voices.

* Disks round, conspicuous; fingers somewhat webbed; skin roughened. . . . . HYLA, 1.

** Disks small; fingers not webbed.

† Toes webbed only at base or not at all; tympanum distinct. CHOROPHILUS, 2.

†† Toes broadly webbed; tympanum indistinct. . ACRIS, 3.

1. **HYLA,** Laurenti. TREE FROGS.

1. ***H. versicolor,*** LeConte. COMMON TREE TOAD. Green, gray or brown, with irregular dark spots; below yellow or white; fingers one-third webbed; exceedingly variable. E. U. S., very abundant.

2. ***H. pickeringii,*** Holbrook. PICKERING'S TREE TOAD. Yellowish brown with dusky rhomboidal spots and lines sometimes arranged in the form of a cross. E. U. S.

3. ***H. andersonii,*** Baird. ANDERSON'S TREE TOAD. Deep pea-green; sides with irregular yellow spots; a purplish band on sides of head. N. J. to S. C., rare

2. **CHOROPHILUS,** Baird. LITTLE TREE FROGS.

1. ***C. triseriatus,*** (Wied.) Baird. TREE FROG. E. U. S.

3. ACRIS, Dumeril and Bibron. CRICKET FROGS.

1. **A. gryllus,** (Le C.) var. **crepitans,** (Baird) Cope. CRICKET FROG. Brownish above; middle of back and head bright green; a dark triangle between the eyes; sides with three oblique blotches; a white line from eye to ear. E. U. S. (the typical *gryllus* southward.)

FAMILY LXXX. — BUFONIDÆ.

(*The Toads.*)

Maxillaries toothless; toes webbed, not dilated at their tips; ear well developed; skin usually warty. Genera three, species thirty; in every part of the world except Australia. Most of them belong to the familiar genus, *Bufo.*

1. BUFO, Laurenti. TOADS.

1. **B. lentiginosus,** Shaw. AMERICAN TOAD. Brownish olive with a yellowish vertebral line and some brownish spots; adults very warty; young nearly smooth. U. S., very common, variable; the northern form is var. *americanus* (Le C.) Cope.

ORDER X.—URODELA.

(*The Salamanders.*)

Body naked, elongated, subcylindrical; four limbs developed; tail persistent, usually much longer than broad, terete or compressed; no external branchiæ when adult.

FAMILY LXXXI.—SALAMANDRIDÆ.

(*The Newts.*)

Vertebræ concave behind only (opisthocœlian); carpus and tarsus ossified. Palatine teeth in two series diverging; backward; no parasphenoid teeth. Species, 25, mostly European.

* Tongue small, thick, oval, attached by nearly its whole inferior surface; toes 4–5, outer and interior on hind foot rudimentary; our species spotted. . . . . DIEMYCTYLUS, 1.

1. DIEMYCTYLUS, Rafinesque. SPOTTED NEWTS.

> *Notophthalmus*, Raf.

1. ***D. viridescens,*** Raf. SPOTTED TRITON. NEWT. EVET. EFT. Above olive green of varying shades; lemon yellow below; each side with a row of several rather large vermillion spots, each surrounded by a black ring; back with a pale streak; belly, etc., with small black dots. E. U. S., abundant E. of the Alleganies; in ponds and brooks.

2. ***D. miniatus,*** Raf. RED EFT. RED EVET. Color vermillion red of varying shade, paler or yellowish below; markings precisely as in the foregoing; same range, but found away from water, under stones, etc.; comes out after rain. Perhaps a variety or state of the preceding, at least Prof. Cope so considers it.

FAMILY LXXXII.—DESMOGNATHIDÆ.

(*The Desmognaths.*)

Vertebræ opisthocœlian; carpus and tarsus cartilaginous; no crests or other dermal appendages developed at the breeding season. Genus one; species three; all of the Eastern U. S. In external characters, this family is scarcely distinguishable from the next, but the skeletal distinctions are quite numerous. They are, however, too technical for our present purpose. "The examination of the skeleton of species of this genus utterly changes the impressions produced by a consideration of the external characters. It may be stated as characteristic of the Batrachia in general, that their affinities can not be determined without study of the skeleton." *Cope.* Proc. Phil. Ac. Nat. Sc. 1869, 113.

1. DESMOGNATHUS, Baird. DUSKY SALAMANDERS.

1. ***D. ochrophœa,*** Cope. YELLOW DESMOGNATH. Brownish yellow with a brown shade on each side; a yellowish dorsal band; back with a few spots; belly unspotted; tail rounded; ♂ with lower jaw toothless behind; costal folds 14; size small; scarcely aquatic. Allegany Mountains, N. Y., southward.

2. ***D. fusca,*** (Raf.) Baird. DUSKY SALAMANDER. Brown above, with gray or purplish spots or shades, becoming blackish with age; marbled below; eyes prominent; tail compressed and keeled, as long as head and body; costal folds 14; larger. Mass. to Ohio and S.; one of the commonest species in springs and brooks; remarkable for its activity and strength.

3. ***D. nigra,*** (Green) Baird. BLACK SALAMANDER. Uniform black; tips of tail, jaws, etc., brown; tail compressed and finned; costal folds 12. Penn., S. in the mountain springs; the largest Eastern Salamander.

FAMILY LXXXIII.—PLETHODONTIDÆ.

(*The American Salamanders.*)

Vertebræ amphicœlian; carpus and tarsus cartilaginous. Various other distinctive characters are given by Prof. Cope, but we omit them here as not available for our present purpose. Genera eleven; species thirty; nearly all North American.

* The tongue attached by a band running from its central or posterior pedicel to the anterior margin; premaxillaries 2.

† Toes 4–4, small, ashy above, spotted below. HEMIDACTYLIUM, 1.

†† Toes 4–5; colors dark; spotted or banded. PLETHODON, 2.

** Tongue free all around, attached by its central pedicel only; toes 4–5, all free.

‡ Premaxillaries united; color yellow or red, spotted or striped. Spelerpes, 3.

‡‡ Premaxillaries 2; color purplish gray or salmon color, unspotted. . . . . Gyrinophilus, 4.

1. *HEMIDACTYLIUM*, Tschudi. Four-Toed Salamanders.

1. ***H. scutatum***, (Schl.) Tsch. Four-Toed Salamander. Ashy brown above; snout yellow; silvery below, with dots like ink spots; tail slender, nearly twice the length of the body; head blunt. R. I. to Ills., and S. (S. *melanosticta*, Gibbes.)

2. *PLETHODON*, Tschudi. Plethodonts.

1. ***P. erythronotus***, (Green) Baird. Red-Backed Salamander. Plumbeous above, often with a broad red dorsal band; belly marbled; body very slender; tail cylindric; inner toes rudimentary; costal folds 16 to 19. E. U. S., common. [*P. cinereus*, (Green) Cope, variety without red dorsal band.]

2. ***P. glutinosus***, (Green) Baird. Viscid Salamander. Black, usually with gray lateral blotches and smaller dorsal spots; stout; tail rounded; inner toes well developed. E. U. S., chiefly terrestrial, like the preceding.

3. *SPELERPES*, Rafinesque. Cave Salamanders.

1. ***S. bilineatus***, (Green) Baird. Two-Striped Salamander. Yellow with a dark line along each side of the back; belly unspotted; tail not keeled; costal folds 14; small. Maine to Wis. and S.

2. ***S. longicaudus***, (Green) Baird. Cave Salamander. Lemon yellow; sides with many small black spots; a median dorsal series; belly spotless; tail keeled, very

long, spotted or barred with black; costal folds 13; large. Maine to Minn. and S., abounding in the caves of Ky. and Ind.

3. **S. ruber,** (Daudin) Gray. RED TRITON. Vermilion red, with black or brown spots; head wide; costal folds 15 or 16; large; variable. Maine to Nebraska and S. (*Pseudotriton*, Baird.)

4. GYRINOPHILUS, Cope. PURPLE SALAMANDERS.

1. **G. porphyriticus,** (Green) Cope. PURPLE SALAMANDER. Uniform purplish gray above; head broad; tail rounded at base, not finned; large; aquatic. Allegany Mountains, N. E. and S. [*Spelerpes salmonea* (Stor.) Gray.] "The only one of our Eastern Salamanders which attempts self defense. It snaps fiercely but harmlessly and throws its body into contortions in terror." (*Cope.*)

FAMILY LXXXIV.—AMBLYSTOMIDÆ.

(*The Amblystomas.*)

Vertebræ amphicœlian; carpus and tarsus ossified; digits 4–5, without webbing; tongue thick; size generally large and color dark. Genus one, species nineteen; probably all American, and very abundant in the Southern and Western parts of the U. S. The larvæ which reach a large size, and even breed before the gills are absorbed, have long been considered as forming a separate genus, *Siredon*, supposed to be allied to *Necturus*.

1. AMBLYSTOMA, Tschudi. BIG SALAMANDERS.

* Folds of tongue radiating from behind; costal folds 10 to 12; fourth toe with 4 phalanges.

† Costal grooves 10.

1. **A. talpoideum,** (Holbr.) Gray. MOLE SALAMANDER.

Blackish brown, gray-speckled; tail short, compressed, 2½ in length; head very broad; body short and squat. Southern, N. to S. Ills.

†† Costal grooves 11.

‡ Sole with one indistinct tubercle, or none.

2. **A. opacum,** (Gravenhorst) Baird. OPAQUE SALAMANDER. Black above, with bluish gray bars; belly dark blue; no dorsal furrow, no enlarged pores on the head; tail 2½ in total length; body stout. Penn. to Wis. and S. A handsome species. (*S. fasciata*, Green.)

3. **A. punctatum,** (L.) Baird. LARGE SPOTTED SALAMANDER. Black above with a series of round yellow spots on each side of the back; body broad, depressed and swollen; skin punctate with small pores, from which exudes a milky fluid (*Cope*); two or three clusters of enlarged pores on head; a strong dorsal groove; tail 2⅓ in length; large. U. S., E. of the Rocky Mountains. (*A. venenosa* and *subviolacea*, Auct.)

4. **A. conspersum,** Cope. SMALLER SPOTTED SALAMANDER. Lead colored, with one or two series of small yellow spots along sides; no dorsal groove; skin smooth; tail 2½ in length; small. Penn. to Ga.

‡‡ Sole with two distinct tubercles.

5. **A. bicolor,** Hallowell. TWO-COLORED SALAMANDER. Olive brown, yellowish below, rising in blotches on the sides; a few large yellowish spots above; limbs banded; tail yellow with brown spots. New Jersey.

††† Costal grooves 12.

a. Large species; sole with two distinct tubercles.

6. **A. tigrinum,** (Green) Baird. TIGER SALAMANDER. Chiefly brown with many yellow spots, about as large as the eye; body thick and strong; the head comparatively long and narrow; tail shorter than head and body; color

varying from uniform brown to yellow, but usually spotted. U. S., E. of the Rocky Mountains. (*A. ingens*, Hallowell.)

7. ***A. xiphias,*** Cope. LONG-TAILED SALAMANDER. Yellow-olive with brown reticulating bands; head small, blunt; tail very long, much longer than the head and body. Ohio.

aa. Small species; sole with one indistinct tubercle or none.

8. ***A. jeffersonianum,*** (Green) Baird. JEFFERSON'S SALAMANDER. Olive brown or blackish, usually with pale or bluish spots, but sometimes uniform plumbeous. Va. to Ind. and N., variable; several varieties are recognized by Prof. Cope.

** Folds on tongue radiating from the median longitudinal furrow; costal folds 12; size small.

9. ***A. microstomum,*** Cope. SMALL-MOUTHED SALAMANDER. Lead-colored, usually with gray shades and specks; head small, short, broad; body slender; skin very smooth and slippery; lower jaw projecting. Ohio to Kansas and S.

FAMILY LXXXV.—MENOPOMIDÆ.

(*The Menopomes.*)

Salamanders of large size, having the form of *Amblystoma*, but with an orifice on each side of neck persistent during life; no external gills; legs well developed; toes 4–5; aquatic. Genus one; species two, *Crypt. fuscus*, Holbr., of the head waters of the Tennessee, and the following:

1. ***CRYPTOBRANCHUS,*** Leuckart. HELLBENDERS.

1. ***C. alleghaniensis.*** Harlan. HELLBENDER. BIG WATER LIZARD. Blackish; length 1½ to 2 feet. Mississippi Valley to N. C. and S.

FAMILY LXXXVI.—AMPHIUMIDÆ.

(*The Congo Snakes.*)

Salamanders of large size, having the body elongated almost serpentiform; limbs rudimentary with two or three toes each; a spiracle on each side of neck as in the preceding family; aquatic. Genera two; the three-toed *Murænopsis* (*M. tridactylus*) and the two-toed *Amphiuma*. Species two, inhabiting the ditches and streams of the warmer parts of the U. S.

1. AMPHIUMA, Linnæus. TWO-TOED CONGO SNAKES.

1. ***A. means,*** L. CONGO SNAKE. Dusky; limbs very small, each with two toes. Southern States, N. to N. C.

ORDER Y.—PROTEIDA.

(*The Proteans.*)

Tailed Batrachians, provided with bushy external gills which are persistent during life; lungs more or less developed and functional, hence these animals are truly amphibious.

FAMILY LXXXVII.—PROTEIDÆ.

(*The Mud Puppies.*)

Salamanders of medium or large size, provided with bushy external gills, and having the branchial clefts remaining open through life; teeth well developed. Genera two. *Proteus* inhabitating caves in S. W. Austria (*Carniola*), and *Necturus* of the fresh waters of the U. S. *Proteus* is blind and has the toes 3–2. *Necturus* has the eyes well developed, though small, and the toes 4–4.

1. **NECTURUS,** Rafinesque. MUD PUPPIES.

= *Menobranchus*, Harlan.

1. **N. maculatus,** Raf. MENOBRANCHUS. MUD PUPPY (North). WATER DOG (South). DOG FISH. Brown, more or less spotted; young with traces of a lateral band; dusky below; gills large and bushy, bright red, forming three tufts on each side; head broad, depressed; tail much compressed. E. U. S., chiefly northern and west of the Alleganies, especially abundant in the Great Lake Region; reaches a length of eight inches to two feet. (*M. maculatus*, *hyemalis*, etc., of authors.) Another species. *N. punctatus*, (Gibbes) Cope, occurs in S. C.

FAMILY LXXXVIII.—SIRENIDÆ.

(*The Sirens.*)

Body elongated, eel-like; external branchiæ persistent; no posterior limbs, not even a vestige of pelvis; head flattened; snout obtuse; mouth narrow, the lower jaw with teeth all around, the upper toothless; eye very small. (*Cuvier.*) Genera two, species two,—*Pseudobranchus striatus*, (LeC.) of Georgia, a small species with small gills, and the following:

1. **SIREN,** Linnæus. SIRENS.

1. **S. lacertina,** L. GREAT SIREN. Reaches a length of three feet. Southern, N. to N. C. and S. Ills.

Class V.—Pisces.

(*The Fishes.*)

A fish is a cold-blooded vertebrate, adapted for life in water, having the limbs developed as fins, the fingers and toes being represented by cartilaginous rays connected by membrane (in rare cases limbs rudimentary or wanting); exoskeleton usually developed as scales or bony plates (skin rarely naked); one or more fins on the median line of the body, composed of rays connected by membrane. Skull developed, containing a brain of several differentiated ganglia; a distinct lower jaw. Heart with an auricle, ventricle, and arterial bulb; respiration by means of branchiæ, which consist (typically) "of bony arches attached to the hyoid bone, to which the filaments of the gills are attached, generally in a row upon each, and having their surface covered by a tissue of innumerable blood vessels. The water taken in at the mouth passes among the filaments of the gills and escapes by the gill openings towards the rear; in its progress through the filaments of the gills the water imparts to these the oxygen of the air which it contains. The blood is sent to the gills by the heart, which thus answers to the right side of the heart of warm-blooded animals, and from the gills it is sent to an arterial trunk lying along the under side of the vertebral column, which distributes the blood through the body of the fish" (*Cuvier*); branchiæ free, gill openings a single cleft on each side. In most fishes there is a membranous air bladder immediately beneath the back-bone, answering homologically to the lungs of the higher vertebrates; in a few Ganoids the air bladder is cellular, and more or less functional and connected by a glottis with the œsophagus; in most of the soft-rayed *Teleocephali* there is a slender duct connecting the air bladder with the alimentary canal; in the *Acanthopteri* and others this is wanting. Reproduction by eggs of small size, which are fertilized generally after exclusion; a few are ovoviviparous.

As here characterized, the class *Pisces* includes the *Teliosts* and *Ganoids*, of authors, and excludes the Sharks and Skates and their allies, as well as the Lampreys and Lancelets, which differ from the true Fishes more than the latter do from the Batrachians.

The following key includes not only the families of fresh water fishes described in this work, but also all of the families of Fishes represented on the Atlantic Coast of the U. S. The names of those families which are exclusively marine are printed in italics, and no further reference is made to them. A student, therefore, who traces a fresh water fish to any of them will understand that there is an error on his part or mine. The key is, of course, purely artificial, and does not, in most cases, give true family distinctions, for instance:

With 5 to 9 detached finlets behind dorsal and anal; dorsals 2; scales small or none. . . *Scombridæ*, the *Mackerels.*

does not imply that all *Scombridæ* possess those characters, nor, indeed, that all possessing them are *Scombridæ;* but that all fishes in the region *here covered*, which show those peculiarities, are to be referred to that family.

SUB-CLASS I. Tail homocercal (caudal fin rarely wanting); optic nerves simply crossing, without chiasma; arterial bulb simple, with two opposite valves at its origin; air bladder, if present, not cellular; exoskeleton typically of scales, either ctenoid or cycloid. . . . . . . TELEOSTEI, page 201.

SUB-CLASS II. Tail heterocercal; optic nerves forming a chiasma; arterial bulb with several rows of valves; air bladder frequently cellular and lung-like; exoskeleton typically of bony plates. . . . . GANOIDEI, page 212.

ORDERS OF TELEOSTEI.

Gills pectinated—of the ordinary sort, not tuft-like.

I. Maxillaries normally developed and normally distinct from each other; gills not in the axils; typical fishes (characters too various to be here summarized). . TELEOCEPHALI, Z.

II. With 4 to 8 long barbels about the mouth, the longest of which is a continuation of the incomplete maxillary; subopercle wanting; ventrals abdominal; usually an adipose fin and dorsal and pectoral spines; skin naked or with bony plates; chiefly in fresh water. NEMATOGNATHI, AA.

III. Maxillaries rudimentary or wanting; scapular arch free from skull; body elongated, serpentiform, with a long dorsal and anal, which meet around the tail; no ventral fins; scales small or none; jaws with teeth; chiefly marine. . . . . APODES, BB.

IV. Carpal bones elongated, forming a kind of arm which supports the pectorals, in the axils of which are the small gill openings; ventrals jugular, with 4 or 5 soft rays; body scaleless or tuberculate; head very large; marine. PEDICULATI, page 211.

V. Intermaxillaries immovably united with the maxillaries; skin rough, often covered with spines or ganoid plates; ventral fins wanting; marine. PLECTOGNATHI, page 212.

** Gills small, tuft-like, largest at their free tips; body covered with bony plates; mouth small, toothless, at the end of the long snout; no ventral fins; marine. LOPHOBRANCHII, page 212.

Z. SUB-ORDERS OF TELEOCEPHALI.

I. Body flat, unsymmetrical; both eyes on the upper or colored side; ventrals jugular. . . HETEROSOMATA, page 208.

II. Bones of snout prolonged into a long tube which bears the short jaws at the end. . . HEMIBRANCHII, page 209.

III. With two or more free spines in place of first dorsal; ventrals sub-abdominal, of a stout spine and a small ray; small fishes scaleless or with bony plates. . HEMIBRANCHII, page 209.

IV. Dorsal fins two, distinct, small, the first of 4 to 7 spines; ventrals abdominal; teeth feeble or wanting; scales cycloid, silvery. . . . . . . PERCESOCES, page 208.

V. With the first rays of the dorsal, or the whole first dorsal, of simple — usually stiff spines; first ray of ventral usually inarticulate (spinous dorsal forming a hump in *Cyclopterus*; a lamellated sucking disk in *Echeneis*, etc., wanting altogether in *Aspidophoroides* and *Gobiesox*). ACANTHOPTERI, page 203.

VI. Fin rays soft and articulated (excepting occasionally one or two in dorsal or anal); no ventral spines; scales when present, usually cycloid.

* Ventrals jugular; dorsal and anal long, often divided. ANACANTHINI, page 208.

** Ventrals abdominal.

† Mouth entirely toothless; abdomen not serrated; lower pharyngeals falciform, tooth-bearing; no adipose fin; head naked; fresh water. . EVENTOGNATHI, page 211.

†† Body elongated, scaly; a series of keeled scales along sides of abdomen; lower pharyngeals united (as in *Labridæ*); no air duct; no adipose fin; no ventral serratures; one or both jaws or else pectoral fins greatly elongated; chiefly marine. . . SYNENTOGNATHI, page 209.

††† Head more or less scaly (naked in *Amblyopsis*, the Cave Blind Fish); both jaws fully provided with teeth; lower jaw usually longest; dorsal far back, nearly opposite anal; no adipose fin, ventral serratures, nor peculiar scales; chiefly fresh water. . HAPLOMI, page 209.

†††† Soft-rayed fishes showing none of the above combinations of characters; head naked; adipose fin or abdominal serratures often present; dentition and habitat various. ISOSPONDYLI, page 210.

*** Ventrals entirely wanting.

‡ Jaws with teeth; vent at the throat; body oblong; cave fishes. . . . . . HAPLOMI, page 209.

‡‡ Jaws toothless; vent normal; body serpentiform. ANACANTHINI, page 208.

FAMILIES OF ACANTHOPTERI.

1. With 5 to 9 detached finlets behind dorsal and anal; dorsals two; scales small or none. . *Scombridæ*, the *Mackerels*.

2. Upper jaw prolonged into a "sword"; teeth feeble or wanting; scaleless; size large. . . *Xiphiidæ*, the *Sword-Fishes*.

3. Tail ending in a sharp point; no caudal nor ventrals; teeth strong. . . . . *Trichiuridæ*, the *Hair-Tails*.

4. First dorsal on the top of head, modified into a lamellated sucking disk. . . . *Echeneididæ*, the *Remoras*.

5. Ventral fins completely united, sometimes forming a sucking disk.

— Dorsals two, distinct; body scaly or not. . GOBIIDÆ, 96.

— Dorsal single; spinous dorsal enveloped in skin, forming a hump in the adult; scaleless, tuberculate. *Cyclopteridæ*, the *Lump-Suckers*.

— Dorsal single; body elongated; scaleless; small fishes often parasitic in shells of Mollusks. *Liparididæ*, the *Sea Snails*.

6. Ventral fins wide apart, with a sucking disk between them; dorsal spineless, on the tail. *Gobiesocidæ*, the *Pike-Suckers*.

7. With a stout, sharp spine on each side of tail; body much compressed. . . . . *Acanthuridæ*, the *Surgeons*.

8. With several unconnected spines in place of the first dorsal.

— Tail with a keel on each side. *Carangidæ*, the *Pilot Fishes*.

— Anal fin preceded by two free spines; body compressed and elevated. . . . *Carangidæ*, the *Pilot Fishes*.

— Tail not keeled; jaws toothless; body very long and slender. *Ammodytidæ*, the *Sand Launces*.

— Tail without a keel; jaws with teeth.

Body long; snout elongated. *Elacatidæ*, the *Crab-Eaters*.

Body short, compressed; snub-nosed. *Stromateidæ*, the *Harvest Fishes*.

9. With none of the preceding combinations.

* With two distinct dorsal fins — rarely slightly connected by membrane at the base.

† Body with developed scales or bony plates, large or small.

1. Small fresh water fishes (1 to 6 inches long); elongated or fusiform, often brightly colored; the fins — especially the pectorals — well developed; anal spines one or two; branchiostegals 6. . ETHEOSTOMATIDÆ, 89
2. Pectoral fins very long, reaching at least to anal, with 3 detached appendages or else several connected, forming an additional fin· cheeks mailed; head bony. *Triglidæ*, the *Gurnards.*
3. With 7 or 8 filiform appendages on each side below the pectorals; cheeks not mailed. *Polynemidæ*, the *Thread-Fishes.*
4. Throat with two long barbels. *Mullidæ*, the *Surmullets.*
5. Dorsal spines only two; scales minute, imbedded in the skin. . . . *Rhypticidæ*, the *Soap Fishes.*
6. Ventrals abdominal; body elongated; scales cycloid; teeth stout. . . *Sphyrænidæ*, the *Barracudas.*
7. With none of the above combinations; ventrals mostly thoracic.
    - *a.* Some or all of opercular bones, more or less serrated or spinous.
        - *b.* With teeth on the vomer.
            - *c.* First dorsal low and weak of 8 spines; scales small; one or more minute spines in front of anal; teeth strong. . *Pomatomidæ*, the *Blue Fishes.*
            - *cc.* Dorsal spines stout; scales ctenoid; no free anal spines.
                - *d.* Ventrals 1–5; branchiostegals usually 7.
                    - *e.* Cleft of mouth horizontal or oblique; scales firm.
                        - — Anal spines 2, sometimes obscure. PERCIDÆ, 90.
                        - — Anal spines 3, distinct. . LABRACIDÆ, 91.
                    - *ee.* Cleft of mouth nearly vertical; scales large, deciduous. *Chilodipteridæ*, the *Apogons.*
                - *dd.* Ventrals 1–7; branchiostegals 8; anal spines 4. *Berycidæ*, the *Berycoids.*

bb. No teeth on the vomer; anal spines 1 or 2; lateral line usually running up on the caudal fin.
SCIÆNIDÆ, 94.

aa. Edges of opercular bones entire.

f. Scales well developed, not enlarged along lateral line; chin often with barbels; no free spines.
Sciænidæ, the *Maigres*.

ff. Scales minute; no barbels.

g. Body more or less compressed and elevated; scales sometimes enlarged along lateral line; usually 2 free anal spines. *Carangidæ*, the *Pilot Fishes*.

gg. Body long and low; no free spines nor lateral shields. . . . . *Gobiidæ*, the *Gobies*.

†† Body entirely scaleless.

h. Body more or less depressed; eyes high up on the broad head; caudal usually rounded.

i. Dorsal with 4 spines; ventrals jugular I, 5; mouth vertical. . . *Uranoscopidæ*, the *Star Gazers*.

ii. Dorsal with 3 spines; ventrals jugular I, 2; mouth broad, with conical teeth.
Batrachidæ, the *Toad Fishes*.

iii. Dorsal spines 6 or more; ventrals thoracic; cheeks mailed (*i. e.*, the sub-orbital bone extending backward over the cheek, articulating with the preopercle).

— Spinous dorsal shortest, its middle rays highest; head without barbels. . . COTTIDÆ, 95.

— Spinous dorsal longest, notched, its first rays highest; head with many fleshy slips.
Hemitripteridæ, the *Sea Ravens*.

hh. Body greatly compressed; the eyes lateral or anterior; fins often filamentous; tail usually slender, the caudal fin widely forked.

j. A series of bony shields along base of second dorsal.
Zenidæ, the *John Dories*.

jj. No bony shields; usually two free anal spines.
Carangidæ, the *Pilot Fishes*

** Dorsal fin single, not divided to its base.

k. Fresh water species.

l. Ventrals I, 5; dorsal spines 5 to 12; vent normal. B. 6.

m. Teeth on vomer; anal spines 3 to 9. CENTRARCHIDÆ, 92.

mm. No teeth on vomer; anal with 2 (or 1) spines, the second very strong. . . . SCIÆNIDÆ, 94.

mmm. No teeth on vomer; no lateral line; dorsal with five spines; anal with three. . ELASSOMIDÆ, 92 (*b*).

ll. Ventrals 7-rayed; dorsal spines 3; vent jugular. APHODODERIDÆ, 93.

kk. Marine species.

1. Cheeks mailed (as in *Cottidæ*, etc.)

n. Body covered with bony, keeled plates; no dorsal spines. . . . *Agonidæ*, the *Sea Poachers.*

nn. Body with ordinary scales; spinous dorsal many-rayed. . . *Scorpænidæ*, the *Sea Scorpions.*

2. With broad, cutting, incisor-like front teeth, or with crushing, molar-like lateral teeth or both; scales rather large; usually a recumbent free spine in front of the dorsal fin; lower pharyngeals not united.

o. Opercular bones entire; vertical fins not much scaly. *Sparidæ*, the *Sea Breams.*

oo. Preopercle denticulated; soft parts of vertical fins densely scaly. . *Pimelepteridæ*, the *Fat-Fins.*

3. Body much compressed and elevated; the soft rays of the vertical fins covered high up with ctenoid scales; teeth villiform; body often dark-banded.

p. Dorsal with less than 10 spines, separated by a notch from the soft part; spinous dorsal scaleless. *Ephippidæ*, the *Moon Fishes.*

pp. Dorsal undivided, with 10 or more spines, scaly throughout; fins often filamentous. *Chætodontidæ*, the *Chætodonts.*

4. Ventrals wanting; scales minute; body high, much compressed. . *Stromateidæ*, the *Harvest Fishes.*

5. Ventrals jugular, few-rayed or wanting; body long and low; dorsal fin very long, occupying most of the back, at least half of it and sometimes all composed of flexible spines; scales small or none; usually an anal papilla.

q. Ventrals present.

r. Dorsal with both spines and soft rays. *Blenniidæ*, the *Blennies.*

rr. Dorsal composed of spines only.

s. Lateral line usually present and sometimes duplicated; head conic; compressed; pyloric cœca present. . . *Stichæidæ*, the *Snake Blennies.*

ss. No lateral line; ventrals I, 1; no pyloric cœca; teeth, small, acute. *Xiphidiontidæ*, the *Gunnels.*

qq. No ventral fins.

t. Gill openings wide; scales rudimentary; cleft of mouth not vertical; teeth strong. *Anarrhichadidæ*, the *Wolf Fishes.*

tt. Gill openings moderate; no scales; cleft of mouth nearly vertical; dorsal of spines only; body almost eel-like. . *Cryptacanthidæ*, the *Ghost Fishes.*

6. With none of the preceding combinations.

u. Ventrals jugular, 4-rayed; dorsal very high and long. *Bramidæ*, the *Winged Dolphins.*

uu. Ventrals thoracic, I, 5.

v. Dorsal of 50 or more rays running from head to tail; the spinous part not differentiated. *Coryphænidæ*, the *Dolphins.*

vv. Dorsal shorter, the two sorts of rays different.

w. Lateral line interrupted.

x. Scales ctenoid; dorsal spines 13; depth more than half length. *Pomacentridæ*, the *Demoiselles.*

xx. Scales cycloid; dorsal spines 9; depth less than half length. . *Labridæ*, the *Wrasse Fishes.*

ww. Lateral line continuous.

y. Opercle or preopercle or both distinctly serrated.

z. Spinous dorsal longer than the soft part, of 18 spines which are tipped with little membranous appendages; scales cycloid. *Labridæ*, the *Wrasse Fishes.*

zz. Dorsal spines 8, very low, nearly equal and scarcely connected; snout blunt.
Stromateidæ, the *Harvest Fishes*.

zzz. With neither of the preceding combinations.

a. No teeth on vomer.
Pristipomatidæ, the *Red Mouths*.

aa. Teeth on vomer.

b. Canines present; branchiostegals 7.
Serranidæ, the *Sea Bass*.

bb. No canines; branchiostegals 6; eyes large. . *Priacanthidæ*, the *Big Eyes*.

yy. Opercular bones with entire edges.

c. Dorsal with nine to 20 spines; anal III, 8 or more; lips large, fleshy.
Labridæ, the *Wrasse Fishes*.

cc. Dorsal with 9 spines; anal III, 7.
Gerridæ, the *Gerroids*.

FAMILIES OF ANACANTHINI.

* Ventrals jugular, sometimes rudimentary.

† Caudal fin developed as a separate fin; lateral line continuous.
Gadidæ, 97.

†† Caudal fin not separate, dorsal and anal confluent around the tail.

‡ Ventral fins developed, 4-rayed. *Lycodidæ*, the *Eel Pouts*.

‡‡ Ventral fins replaced by a pair of bifid filaments.
Ophidiidæ, the *Cusk Eels*.

** Ventral fins entirely wanting.

a. Vent remote from the head. *Ammodytidæ*, the *Sand Launces*.

aa. Vent at the throat; size small. *Fierasferidæ*, the *Fierasfers*.

FAMILIES OF HETEROSOMATA.

* Pectoral fins well developed. . *Pleuronectidæ*, the *Flounders*.

** Pectoral fins wanting or rudimentary. . *Soleidæ*, the *Soles*.

FAMILIES OF PERCESOCES.

* First dorsal with 5 to 7 flexible spines; body elongated; sides with a distinct silvery band. . . Atherinidæ, 99.

** First dorsal with 4 stiff spines; body compressed; no lateral band. . . . . . . *Mugilidæ*, the *Mullets*.

FAMILIES OF HEMIBRANCHII.

* Bones of head moderately produced; ventral fins of a stout spine and a rudimentary ray; dorsal preceded by free spines; scaleless, naked or with bony plates; an oblong, silvery, naked area in front of pectorals. . GASTEROSTEIDÆ, 98.

** Bones of head much produced, forming a long tube which bears the short jaws at the end; ventral fins without spine.

† Body compressed; no teeth; scales small; dorsal fins two; first with spines. . . *Centriscidæ*, the *Snipe Fishes*.

†† Body greatly elongated; teeth present; no scales; no dorsal spines; middle rays of caudal produced into a long filament. . . . *Fistulariidæ*, the *Trumpet Fishes*.

FAMILIES OF SYNENTOGNATHI.

* Jaws one or both elongated into a long beak.

† Both jaws elongated; no finlets; size large. *Belonidæ*, the *Gar-Fishes*.

†† Lower jaw only elongate, or else dorsal and anal with detached finlets, as in the Mackerels. *Scomberesocidæ*, the *Sauries*.

** Jaws moderate; pectorals elongated, nearly as long as body, used for "flying." . . *Exocœtidæ*, the *Flying Fishes*.

FAMILIES OF HAPLOMI.

* Snout depressed and elongated, its length more than half the greatest depth of body; jaws, vomer, palate and tongue armed with strong, hooked teeth; body elongated, sub-terete; size large; in fresh water. . . . . ESOCIDÆ, 102.

** Snout rounded and rather short, its length being less than half the greatest depth of body; teeth moderate; size small.

† Vent jugular, in front of pectorals; eyes often undeveloped; ventrals small or wanting; cave fishes. AMBLYOPSIDÆ, 103.

†† Vent normal: eyes present; ventrals well developed.

‡ Margin of upper jaw formed laterally by maxillaries; lateral line inconspicuous; small dusky fishes of muddy brooks; usually a black bar at base of caudal. UMBRIDÆ, 101.

‡‡ Entire margin of upper jaw formed by intermaxillaries; head depressed; small fishes of brackish or fresh waters, often barred or striped with black. CYPRINODONTIDÆ, 100.

FAMILIES OF ISOSPONDYLI.

* Body entirely scaleless; deep sea fishes.

† No adipose fin; throat with a long barbel; pectorals rudimentary. . . . . *Stomiatidæ*, the *Stomiatoids*.

†† An adipose fin; no barbel; belly with phosphorescent spots. *Scopelidæ*, the *Scopelids*.

** Body scaly; head naked; scales sometimes small and imbedded, sometimes large and deciduous.

‡ An adipose dorsal fin; belly rounded.

a. Margin of upper jaws formed by intermaxillaries alone.

b. Scales cycloid; deep sea fishes. *Synodontidæ*, the *Synodonts*.

bb. Scales ctenoid; fresh water fishes; no teeth on vomer or palate. . . . . . PERCOPSIDÆ, 104.

aa. Lateral margins of upper jaw formed by maxillaries; scales cycloid; in all waters. . SALMONIDÆ, 105.

‡‡ No adipose dorsal; lateral margin of upper jaw formed by maxillaries which are usually composed of three pieces; scales rather large.

c. Abdomen compressed to an edge which is serrated; lateral line obsolete; teeth very small or wanting; in all waters. CLUPEIDÆ, 107.

cc. Abdomen compressed but not serrated; jaws, vomer and tongue with strong teeth; scales large, silvery; body compressed; lateral line well developed; fresh water. HYODONTIDÆ, 106.

ccc. Abdomen rounded; teeth various; marine.

d. Upper jaw longest.

e. Lower jaw toothless; sides with bright silvery band. *Engraulidæ*, the *Anchovies*.

ee. Both jaws with bands of villiform teeth; roof and floor of mouth with coarse patches.
Albulidæ, the *Lady Fishes.*

dd. Lower jaw longest.

f. No gular plates; no lateral line; anal short.
Dussumieridæ, the *Round Herrings.*

ff. A narrow bony plate between branches of lower jaw (much as in *Amia*). . *Elopidæ*, the *Jew Fishes.*

FAMILIES OF EVENTOGNATHI.

* Pharyngeal teeth in small number (not more than 7) and comparatively large; dorsal with 7 to 12 rays (in American species); mouth moderately or not protractile; lips scarcely or not enlarged; species mostly of small size (2 to 15 inches) Dace and Minnows. . . . . CYPRINIDÆ, 108.

** Pharyngeal teeth very numerous, small; mouth very protractile, roundish when protruded, with enlarged, fleshy lips; dorsal with 11 to 40 rays; species often of large size. Suckers.
CATOSTOMIDÆ, 109.

AA. FAMILIES OF NEMATOGNATHI.

* Margin of upper jaw formed by intermaxillaries only; maxillary rudimentary, forming the base of a long barbel.
SILURIDÆ, 110.

BB. FAMILIES OF APODES.

* Gape moderate; stomach ordinary; gill openings narrow.

† Scales rudimentary; dorsal beginning at a considerable distance behind head; fishes of shores or fresh waters.
ANGUILLIDÆ, 111.

†† Scaleless; dorsal beginning close behind base of pectorals; deep sea fishes. . . *Leptocephalidæ*, the *Conger Eels.*

** Gape of mouth enormously wide, leading to an excessively distensible stomach; tail band-like, tapering to a fine filament. . . . . *Saccopharyngidæ*, the *Gulpers.*

FAMILIES OF PEDICULATI.

* Head very broad; depressed.

† Skin smooth, slimy; teeth strong, card-like; dorsal VI—8, or more; the first three spines isolated, tentacle-like, on the head. . . . *Lophiidæ*, the *Fishing Frogs.*

†† Skin with conical tubercles; teeth villiform; dorsal I—4; the spine tentacle-like, retractile into a cavity beneath a prominent protuberance on forehead.
Maltheidæ, the *Sea Bats.*

** Head high, compressed; teeth card-like.
Antennariidæ, the *Diablos.*

FAMILIES OF PLECTOGNATHI.

* Jaws modified into a sort of beak, without distinct teeth.

† Both jaws divided by a median suture (teeth fused into two in each jaw); belly greatly inflatable.
Tetrodontidæ, the *Puffers.*

†† Jaws without median suture; belly scarcely or not inflatable.

‡ Body scarcely compressed, spinous, with a distinct caudal fin. . . . . *Diodontidæ*, the *Box Fishes.*

‡‡ Body much compressed, very short, truncate; the vertical fins more or less confluent.
Orthagoriscidæ, the *Globe Fishes.*

** Jaws with distinct teeth.

a. Front teeth incisor-like; 1 to 3 dorsal spines; no carapace.
Balistidæ, the *File Fishes.*

aa. Teeth slender; no dorsal spines; body enveloped in a box-like carapace, formed of hexagonal bony plates; snout, bases of fins and tail free, covered with skin.
Ostraciontidæ, the *Trunk Fishes.*

FAMILIES OF LOPHOBRANCHII.

* Tail prehensile, without caudal fin; body abruptly contracted at base of tail; head crested, out of line of axis of body.
Hippocampidæ, the *Sea Horses.*

** Tail not prehensile, with a developed caudal; body gradually tapering; direction of head in a line with axis of body.
Syngnathidæ, the *Pipe Fishes.*

ORDERS OF GANOIDEI.

* Skeleton bony; body scaly; air bladder cellular, lunglike (HYOGANOIDEI).

† Scales cycloid; snout short, broad. . CYCLOGANOIDEI, CC.

†† Scales ganoid, diamond-shaped, enamelled plates; snout lengthened, depressed. . . RHOMBOGANOIDEI, DD.

** Skeleton chiefly cartilaginous; body naked or with 3 to 5 rows of bony bucklers; vertical fins with fulcra. (CHONDROGANOIDEI.)

‡ Mouth terminal, broad; lower jaw, maxillaries and palate with many minute, deciduous teeth. SELACHOSTOMI, EE.

‡‡ Mouth narrow, inferior, toothless. . CHONDROSTEI, FF.

CC. FAMILIES OF CYCLOGANOIDEI.

* A broad bony plate between branches of lower jaw; vertical fins without fulcra; dorsal fin very long of more than 40 rays; body stout. . . . . . AMIIDÆ, 112.

DD. FAMILIES OF RHOMBOGANOIDEI.

*Vertical fins with fulcra; dorsal short, far back, of less than 12 rays; body elongated. . . . LEPIDOSTEIDÆ, 113.

EE. FAMILIES OF SELACHOSTOMI.

* Skin naked; snout produced into a flat blade; opercle with a long flap. . . . . . . POLYODONTIDÆ, 114.

FF. FAMILIES OF CHONDROSTEI.

* Body with 5 rows of bony shields (rarely deciduous); snout produced; four barbels in front of mouth. ACIPENSERIDÆ, 115.

Sub-Class.—Teleostei.

(*The Bony Fishes.*)

Skeleton more or less ossified; tail homocercal; optic nerves simply crossing, without chiasma; arterial bulb simple, with two opposite valves at its origin; air bladder, if present, not lung-like; body usually scaly, sometimes covered with naked skin or bony plates; membrane bones (opercles, etc.) developed in relation to the skull. This group comprises the great majority of recent fishes.

ORDER Z.—TELEOCEPHALI.

(*The Typical Fishes.*)

This order again comprises the vast majority of recent fishes, and is characterized rather negatively, as wanting the peculiarities of the other orders than as having any positive distinctions of its own. The maxillaries are normally developed and distinct from each other, never forming the base of a long barbel. The gills are pectinated and of the ordinary pattern, and the gill-openings are in front of the pectorals and never very narrow; the subopercle is present. The scales are (when present) very rarely ossified, and are generally either ctenoid or cycloid. This group includes the *Acanthopterygians* and *Malacopterygians* of Cuvier, and the nearly corresponding *Ctenoidei* and *Cycloidei*, *Physoclysti* and

Physostomi of later writers; but however different the extremes of each (as *Percoids* and *Cyprinoids*) may be, the intervening forms are too closely related to render it possible to characterize them as distinct orders.

SUB-ORDER.—ACANTHOPTERI.

(*The Spiny-rayed Fishes.*)

FAMILY LXXXIX.—ETHEOSTOMATIDÆ.

(*The Darters.*)

Fresh water fishes of small size, closely related to the *Percidæ*, but so peculiar in many respects that it seems preferable to consider them as forming a distinct family. Dorsal fins two, generally connected by membrane at the base, the second and often both dorsals high and large; anal usually well developed, with one or two spines; pectorals (except in one or two species) very large and broad, often reaching beyond base of anal; caudal large, rounded or slightly forked; scales ctenoid, sometimes absent on neck or belly, or both; head usually more or less scaly; teeth well developed on jaws and usually on vomer; branchios. 6; air bladder rudimentary; "sub-orbital arch incomplete." Colors often very bright; species of *Pœcilichthys* and *Diplesium* being the most brilliantly colored fresh water fishes known; sexual differences usually recognizable, the females being as a rule duller in color and more speckled or barred. In most species there is a dark streak from eye to snout, and often a dark vertical bar below the eyes. Genera seventeen, or fewer; species about sixty, all belonging to the U. S. and Mexico, east of the Rocky Mountains, being most abundant in the Mississippi Valley, where almost or nearly all the genera may be found in the same stream.

Most of them prefer clear running water, where they lie on the bottom concealed under stones, darting when frightened or hungry with great velocity for a short distance by a powerful movement of the fan-shaped pectorals, then stopping as suddenly. They rarely use the caudal fin in swimming, and they are never seen moving or floating freely in the water like most fishes. When at rest they support themselves on their extended ventrals and anal. *Pleurolepis*, unlike the others, prefers a sandy bottom, where, by an almost instantaneous plunge, it buries itself in the sand and remains quiescent for hours at a time, with only its eyes and snout visible. All are carnivorous, and, in their way, voracious. All are of small size, the largest (*Percina*) reaches a length of about eight inches, while the smallest (*Microperca*), which is the smallest spiny-rayed fish known, barely attains a length of an inch and a half.

* Lateral line complete; body much elongate, subcylindrical, pellucid, with at least the entire ventral region naked.

a. Body entirely naked, except the caudal peduncle and the lateral line; dorsal fins high, well separated, equal to the anal fin and to each other; a single anal spine; head entirely scaleless; mouth large, with vomerine teeth, the upper jaw protractile. . . . AMMOCRYPTA, 1

aa. Body covered above with small, thin, imbedded scales, the ventral region entirely naked, the dorsal scales obscure but present; dorsal fins small, wide apart; one anal spine*; cheeks and opercles scaly; mouth large, with vomerine teeth, the upper jaw protractile. . PLEUROLEPIS, 2.

** Lateral line complete; body less elongate, entirely scaly, or with definitely naked areas on throat, neck, or ventral line.

† Second dorsal little, if any, larger than anal; the dorsal fins distinct, the first the longer and usually the larger; body little compressed; two distinct anal spines.

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* In the genus IOA, *two* anal spines: see p. 404.

b. Upper jaw not protractile; vomerine teeth present.

c. Mouth narrow, inferior, overlapped by a tapering, truncate, more or less "pig-like" snout; ventral plates present, or, if fallen, a naked strip; body elongated; cheeks and opercles scaly; size largest of all the darters. PERCINA, 3.

cc. Mouth wider, terminal, the upper jaw being but little longer than the lower.

d. Ventral plates developed, or, if fallen, middle line of belly with a naked strip.

e. Body and head elongate; the vertebræ in increased number, more than 20 in front of anus; well-developed teeth on vomer and palatines; dorsal spines 12 to 15; fins never tuberculate. . ALVORDIUS, 4.

ee. Body and head shortened; vertebræ fewer, less than 20 in front of anus; a few minute teeth on vomer and none on palatines; dorsal spines 10 to 12; colors brilliant, the male in Spring with the lower fins tuberculate. . . . . ERICOSMA, 5.

dd. Ventral plates not developed; middle line of belly scaled like the sides. . . HADROPTERUS, 6.

bb. Upper jaw protractile, a distinct furrow separating it from the skin of the forehead.

f. No ventral plates; posterior ventral region scaled; anterior region largely naked; vomer well toothed; head and body stout and heavy; cheeks and opercles scaly; anal fin (in adult males?) greatly elevated, reaching to base of caudal fin. . . . . . IMOSTOMA, 7.

ff. Ventral plates well developed, or, if fallen, a naked strip; vomer with a few minute teeth; palatines naked; body rather slender, with rather narrow head and small subinferior mouth; cheeks naked; opercles scaly; anal fin not enlarged. . . . . . RHEOCRYPTA, 8.

†† Second dorsal considerably larger than anal fin; no ventral plates, the middle line of the belly always covered with small scales like those of the sides.

g. Upper jaw protractile.

h. No teeth on vomer or palatines; mouth small, contracted, subinferior; head short and thick, with swollen cheeks; spinous dorsal rather long; *maxillary non-protractile;* anal spines strong; body elongated, little compressed. DIPLESIUM, 9.

hh. Vomerine teeth present; dorsals contiguous, but distinct; the spinous dorsal short; *max. protractile;* the mouth rather small, horizontal, subinferior.

i. Anal spines two, well developed; the first the longer. ULOCENTRA, 10.

ii. Anal spines obscure and undifferentiated from the soft rays. . . . . . . BOLEOSOMA, 11.

gg. Upper jaw not protractile.

j. Gill membranes broadly connected across breast; scales large; cheeks and opercles scaly; mouth small, horizontal, subinferior (as in *Boleosoma*); caudal peduncle rather slender. . . . NANOSTOMA, 12.

jj. Gill membranes nearly free; body rather short, deep, strongly compressed; scales small; cheeks naked; mouth rather large, oblique (as in *Pœcilichthys*); caudal peduncle deep. . . . . NOTHONOTUS, 13.

*** Lateral line incomplete or wanting; no ventral plates; upper jaw not protractile; second dorsal larger than anal; vomer with teeth.

k. Lateral line present on anterior part of body; anal spines two.

l. Lateral line nearly straight.

m. Spinous dorsal fin well developed, two-thirds or more the height of the second; the spines graduated, never ending in little fleshy knobs; lateral line extending more than half the length of the body; mouth moderate, the upper jaw usually a little the longer; gill membranes free. . . . PŒCILICHTHYS, 14.

mm. Spinous dorsal low and small, the spines subequal, scarcely half the height of the soft rays, in males ending in little fleshy knobs; gill membranes connected; body elongated, compressed. . ETHEOSTOMA, 15.

ll. Lateral line curved upward over the pectorals.

n. Jaws about equal; body elongated. . BOLEICHTHYS, 16.

kk. Lateral line incomplete; anal spine feeble. (See Addenda, p. 405.) . . . . VAILLANTIA.

kkk. No lateral line; dorsal fins small, subequal, well separated; mouth small, with nearly equal jaws; scales large; size smallest of all spiny-rayed fishes. . MICROPERCA, 17.

1. AMMOCRYPTA, Jordan. SAND-DIVERS.

1. ***A. beanii,*** Jordan. BEAN'S DARTER. Body very slender; general form and appearance of *Pleurolepis;* dorsal fins very high; color translucent, with a golden lateral band; dorsal fin with large black spots; D. X—10; A. I, 9; lat. l. 65. Lower Mississippi; a remarkable species.

2. PLEUROLEPIS, Agassiz. PELLUCID DARTERS.

1. ***P. pellucidus,*** (Baird.) Ag. SAND DARTER. Depth 6 to 8 in length; body nearly cylindrical; head elongated, pointed; scales small, finely dotted, far apart, and deeply imbedded; fins small; color pinkish white, pellucid in life, with a series of small, squarish, olive (blue) blotches along back, and another along sides, the spots connected by a gilt line; D. X—9; A. I, 6; length 2 to 3 inches. Ohio Valley, in sandy streams; one of the most interesting of our fishes.

3. PERCINA, Haldeman. LOG PERCHES.

=*Pileoma*, DeKay.

1. ***P. caprodes,*** (Raf.) Girard. LOG PERCH. HOG FISH. ROCK FISH. Salmon yellow or greenish, with about fifteen transverse dark bands from back to belly, these usually alternating with shorter and fainter ones reaching about to lateral line; a black spot at base of caudal; belly with a row of enlarged plates, shed at some

seasons; neck above scaly; D. XIII—12; A. II, 10. Great Lakes and Western Streams, abundant, E. to L. Champlain; the largest of the Darters, reaching a length of six or eight inches. (*P. zebra*, *semifasciata*, *nebulosa*, and *bimaculata* of authors.)

2. ***P. manitou,*** Jordan. MANITOU DARTER. Head notably shorter and broader than in *P. caprodes;* mouth smaller and less inferior; fins larger; lateral bars shorter and more blotch like, not meeting their fellows across the back; space in front of dorsal fin entirely *naked;* D. XV—14; A. II, 10. Indiana (Lake Manitou) to Wisconsin.

4. ***ALVORDIUS,*** Girard. BLACK-SIDED DARTERS. (*Etheostoma*, Agassiz—not of Raf.)

1. ***A. aspro,*** Cope & Jor. BLACK-SIDED DARTER. BLENNY DARTER. Head long, pointed, 4 in length; depth 5 to 5½; belly with a series of caducous plates along the middle line (shed at some seasons.) Straw yellow, with dark tesselations and about seven large blotches along the sides, partly confluent, thus forming a moniliform band; D. XIII, to XV—12; A. II, 9. Ohio Valley, Great Lakes and eastward; one of the most curious and elegant of all the Darters. (*A. aspro*, Cope & Jor. ? *Alvordius* and *Hadropterus maculatus*, Grd. *Etheostoma blennioides*, Ag.)

2. ***A. variatus,*** (Kirt.) Jor. SHIELDED DARTER. Head shorter; sides with broad, brownish shades; ventral shields much larger; D. XII—13; A. II, 9; lat. l. 53. Penn. (*E. peltatum*, Stauff.)

3. ***A. macrocephalus,*** Cope. LONG-HEADED DARTER. Head much elongated, 3½ in length, the snout much longer than the eye; cheeks and opercles naked; colora-

tion nearly that of *A. aspro;* scales quite small; D. XV—13; A. II, 11; lat. l. 77. Headwaters of Ohio River.

4. ***A. phoxocephalus,*** (Nelson) Cope & Jordan. SHARP-NOSED DARTER. Body slender, compressed; head 4 in length, very long, narrow and tapering, the snout very acuminate, scarcely longer than eye; mouth large, with the jaws about equal; cheeks, opercles and neck with small scales; coloration as in the other species except that the spots on the sides are nearly square and rather small; a small black spot at the end of the lateral line; D. XII—13; A. II, 9; lat. l. 68. Indiana to Tennessee and Kansas, a singular species known at once by the coloration and the form of the head.

5. ERICOSMA, Jordan. GILDED DARTERS.

1. ***E. evides,*** Jordan & Copeland. Body rather short and deep; head heavy, 4¼ in length; mouth moderate, the lower jaw the shorter; cheeks, neck above, and throat naked; opercles with a few rather large scales; body with about seven broad transverse bars, black in the female, of a dark rich metallic blue-green in the male, the interspaces between the bars creamy in the female, bronze red in the male; belly chiefly yellow; cheeks orange red; dorsal orange with a black spot; vertical fins chiefly orange; anal somewhat dusky; ventrals blue-black; males with the ventral and anal fins tuberculate in the Spring; D. XI—10; A. II, 9. A most beautiful species, as yet known only from the rapids of White River, above Indianapolis. (*E. nigrofasciatum*, Ed. I., not of Agassiz.)

6. HADROPTERUS, Agassiz. CRAWL-A-BOTTOMS.

(*Hypohomus*, Cope.)

1. ***H. aurantiacus,*** (Cope) Jordan. ORANGE DARTER.

Bright yellow, with a black lateral band formed of confluent spots in front; a few brown spots on back; fins plain; D. XV—15; A. II, 11; size large. Tennessee R.

2. ***H. tessellatus,*** Jordan. Head broad and heavy; mouth large; cheeks and opercles naked, or nearly so; D. X—12; A. II, 8. Allegheny River.

7. ***IMOSTOMA,*** Jordan. Big-headed Darters.

1. ***I. shumardii,*** (Grd.) Jor. Body stout and heavy forward, compressed behind; head blunt, broad and thick, $3\frac{1}{5}$ in length; mouth large, the jaws nearly equal; belly naked anteriorly, scaly behind; cheeks, opercles and neck scaly; breast naked; anal fin large, in males much prolonged, reaching caudal; color dark, vaguely blotched with darker; spinous dorsal with a large black spot behind, a smaller one in front; a strong suborbital bar; D. X—15; A. II, 11; lat. l. 56. Indiana to Illinois and Arkansas.

8. ***RHEOCRYPTA,*** Jordan. Ripple Darters.

1. ***R. copelandi,*** Jordan. Copeland's Darter. Body rather slender; head rather long and narrow, $4\frac{1}{4}$ in length; mouth small, subinferior; cheeks naked; opercles with a few scales; color yellowish, with oblong black spots along the lateral line, smaller than in the species of *Alvordius.* D. XI—10; A. II, 9; lat. l. 56. Rapids of White River, with *Ericosma evides*, a small and rather plain, but graceful species.

9. ***DIPLESIUM,*** Rafinesque. Green-Sided Darters.

=*Hyostoma*, Agassiz.

1. ***D. blennioides,*** (Raf.) Jordan. Green-Sided Darter. Olive green and tessellated above; sides with a series of about seven double transverse bars, each pair

forming a Y-shaped figure; these are joined above, making a sort of wavy lateral band; in life, these markings are of a clear deep green; sides sprinkled with orange dots; head with olive stripes and the usual dark bars; first dorsal dark orange brown at base, blue above, becoming pale at tip; second dorsal and anal of a rich blue green with some reddish; caudal greenish; young specimens much duller, but the peculiar pattern is unmistakable; body stout; head short and thick; D. XII to XIII—13; A. II, 8; length 3 inches. Penn. to Kas. and S., abundant in Indiana, one of the handsomest of fishes. [*H. cymatogrammum*, (Abbott) Cope.] *H. blennioperca*, Cope.)

10. ***ULOCENTRA,*** Jordan. SPECKS.

1. ***U. atripinnis,*** Jordan. BLACK-FINNED DARTER. Body rather stout; head extremely short and deep, $4\frac{1}{5}$ in length of body; the snout very short and abruptly rounded mouth small, with equal jaws; cheeks and opercles scaly; fins large; head black above; about eleven indistinct, bar-like blotches along the sides; fins chiefly black; D. XII—10; A. II, 7. Cumberland River.

2. ***U. simotera,*** (Cope) Jordan. SNUB-NOSED DARTERS. Body short and thick; head very short and blunt; a series of square dark green blotches along sides and another on the back; spotted above with red; belly saffron; soft dorsal chiefly blood-red; first dorsal orange-margined; D. X—11; A. II, 7; lat. l. 52; length 3 inches. Tennessee and Cumberland Rivers.

11. ***BOLEOSOMA,*** DeKay. TESSELLATED DARTERS.

> *Arlina* and *Æstrella*, Grd.

* Lat. l. 40 or less; cheeks naked.

1. ***B. effulgens,*** (Grd.) Cope. Caudal peduncle

thick, not contracted; cheeks naked; snout blackish; D. IX—13; A. II, 8; lat. l. 40; caudal rounded. Maryland to N. C.

2. ***B. vexillare,*** Jor. HIGH-FINNED DARTER. Similar to the preceding, but with the second dorsal very short and high and scales very large; head black; D. IX —10; A. I, 8; lat. l. 34. Rappahannock R., Va,

** Lat. l. more than 40.

3. ***B. olmstedi,*** (Storer) Ag. TESSELLATED DARTER. Fins stouter and higher than in the next; depth $5\frac{1}{4}$ in length; head $4\frac{1}{4}$; olivaceous, fins barred; back tessellated; a black streak forward, and another downward from eye; cheeks and opercles scaly; neck and throat bare; D. IX—14; A. I, 8; lat. l. 50. New England to Wisconsin; abundant eastward. (*B. tessellatum*, DeK.)

4. ***B. atromaculata,*** (Grd.) Jor. Neck and throat scaly; fins very high; spinous dorsal with a large black spot at base. Eastern streams.

5. ***B. nigrum,*** (Raf.) Jor. JOHNNY DARTER. Paler and more distinctly tessellated; brownish yellow; upper surface dotted with brown, the spots forming a few dark bars on back; a dark line from eye to snout; and sometimes a bar below eye; smaller and slenderer than the preceding, with smaller fins; eye as long as the narrow, pointed snout; cheeks, neck and throat naked; opercles scaly; D. IX—12; A. 1, 8 to I, 10; lat. l. 45. E. U. S., abundant, west of the Alleganies. (*B. brevipinne*, Cope.)

6. ***B. æsopus,*** Cope. Caudal peduncle contracted; dorsal outline curved; fins high; brownish, with spots on back and sides; D. VII—14; A. 10; lat. l. 47. Allegheny River, Penn.

12. NANOSTOMA, Putnam. ZONED DARTERS.

1. ***N. zonalis,*** (Cope) Jor. ZONED DARTER. Olivaceous, golden below; six dark brown quadrate spots along the back, connected by alternating spots with a brown lateral band from which eight narrow bands encircle the belly; lower fins yellow with brown spots; spinous dorsal with a crimson band; a series of crimson spots on base of soft dorsal; black spot on opercle, occiput and base of pectorals; black bars downward from eye and forward; D. XI—12; A. II, 7; lat. l. 52. Indiana to Tenn.

13. NOTHONOTUS, Agassiz. BLUE-BREASTED DARTERS.

1. ***N. maculatus,*** (Kirt.) Ag. TROUT DARTER. Body moderately elongate, deep and compressed, head 4 in length; depth $4\frac{2}{3}$; head long and rather pointed; mouth pretty large; jaws equal; dorsal fin elevated, the longest rays reaching caudal; olive, sides with rather large spots of brilliant carmine; vertical fins more or less barred with red and white; D. XII, 13; A. II, 8; lat. l. 60. Mahoning River, Ohio, a rare and handsome species.

2. ***N. camurus,*** (Cope) Jor. BLUE-BREASTED DARTER. Body stout, head short, with the muzzle abruptly decurved, so that the upper jaw is the longer, and the mouth somewhat inferior; dark olive; head blackish above; breast and throat deep blue; sides greenish, sprinkled with carmine spots, much as in a trout; series of olivaceous lines along the rows of scales; vertical fins chiefly crimson at base, then yellow, with a bright blue or black edging, in ♀ merely speckled; lateral line nearly complete; D. XII—13; A. II, 8; lat. l. 52; length $2\frac{1}{2}$ inches. Ohio Valley, not common, one of the handsomest of our fishes; the coloration is often quite dark.

3. ***N. sanguifluus,*** (Cope) Jor. Slender; muzzle not decurved; black, with scattered crimson spots; breast blue; fins crimson without dark margin; D. XII—13; A. II, 9; lat. l. 58. Cumberland River.

4. ***N. vulneratus,*** (Cope) Jor. Stout; muzzle not decurved; back not arched; pale, with dark olive cross-bars and some crimson spots; first dorsal with red spots; second dorsal and caudal dark-margined; D. XIV—13, A. II, 8; lat. l. 53. French Broad R.

5. ***N. rufilineatus,*** (Cope) Jor. Stout; head, etc., as in the preceding; back arched; coloration pale, with narrow dark lines enclosing spaced, quadrate, red-brown spots; belly orange; throat blue; fins largely orange, with a broad vermillion border and a narrow black edge; D. XI—13; A. II, 8; lat. l. 45. French Broad River.

14. ***PŒCILICHTHYS,*** Agassiz. RAINBOW DARTERS.
= *Astatichthys*, Le Vaillant.

1. ***P. cæruleus,*** (Stor.) Ag. BLUE DARTER. RAINBOW FISH. BLUE JOHNNY. Olivaceous, tessellated above, the spots running together into blotches; back without black lengthwise stripes; sides with about twelve indigo blue bars running obliquely downward, most distinct behind, separated by rich orange interspaces; caudal deep orange, edged with bright blue; anal orange, with deep blue in front and behind; soft dorsal chiefly orange, blue at base and tip; spinous dorsal crimson at base, then orange, with blue edgings; ventrals bluish, often deep indigo blue; cheeks blue; throat and breast orange, these two shades very constant; ♀ much duller, with but little or no blue or orange, the vertical fins barred or checked; colors fade in alcohol; body short and stout; head large; D. X—12; A. II, 7; lat. l. 45; length 2 to 3

inches. Mississippi Valley, abundant; the most gaily colored of all the Darters.

2. ***P. spectabilis,*** Ag. Striped Blue Darter. Like the preceding and equally brilliant, but larger and more compressed, and more elongate; back with distinct blackish stripes along the rows of scales, pattern of coloration similar, but the colors having a clear or bleached appearance; with the other, but less abundant; often found in muddy water where *P. variatus* never ventures.

3. ***P. jessiæ,*** Jordan and Brayton. Southern Blue Darter. Cheeks scaly above—not entirely naked as in the two preceding species; lateral line extending to end of second dorsal—farther than in either of the preceding species; chestnut colored above, with squarish blotches of a dark, clear blue on the sides; fins mottled with chestnut or golden; D. XII—12; A. II, 9. Tennessee River.

15. ETHEOSTOMA, Rafinesque. Striped Darters.

(*Catonotus*, Agassiz.)

* Head entirely scaleless; lateral line short; lower jaw longest.

1. ***E. flabellaris,*** Raf. Fan-Tailed Darter. Olivaceous, dusky above; sides with obscure dusky bars; each scale with a brownish spot, these sometimes forming series of longitudinal lines but never *very* distinct ones; head narrow; mouth oblique; body rather slender; fins strongly barred; D. VIII—12; A. II, 8; length 2½ inches. Great Lakes and streams from N. Y., S. and W., abundant. (*E. linsleyi*, H. R. Storer. *Oligocephalus humeralis* and *Catonotus fasciatus*, Girard.)

2. ***E. lineolata,*** (Ag.) Jor. Striped Darter. Olivaceous, each scale with a black spot, hence the body with a series of fine dotted longitudinal lines which are very distinct above; some (♀?) further marked with dark cross

bars; D. VIII—12; A. II, 8. Great Lakes and Mississippi Valley, rather northward; body deeper and colors much brighter than in the preceding, of which it is probably a variety.

** Head scaly; lateral line nearly complete; jaws equal.

2. ***E. squamiceps,*** Jordan. Body elongate; head large, $3\frac{1}{5}$ in length; jaws shorter than in *E. flabellaris;* cheeks, opercles, neck and throat densely scaly; lateral line wanting only on about ten scales; colors dark; fins barred; D. IX—12; A. II, 7. Ohio Valley. A curious species, in some respects intermediate between *Etheostoma* and *Nothonotus*.

16. ***BOLEICHTHYS,*** Girard. RED-SIDED DARTERS.

> *Hololepis*, Agassiz.

1. ***B. fusiformis,*** (Grd.) Jordan. FUSIFORM DARTER. Lateral line on 12 scales, reaching middle of first dorsal; head $3\frac{1}{4}$ in length; yellowish brown; spotted; D. VIII—9; A. II, 7; lat. l. 52. Charles R., Mass.

2. ***B. erochrous,*** (Cope) Jordan. RED-SIDED DARTER. Lateral line extending to middle of first dorsal on 12 to 16 scales; head 4 in length; sides with dusky band, interrupted by red dots; D. IX—10; A. II, 7; lat. l. 44. New Jersey.

3. ***B. eos,*** Jordan & Copeland. SUNRISE DARTER. Body slender, elongate, with long caudal peduncle; mouth small; lateral line to end of first dorsal on 22 to 26 scales; head 4 in length; dark olive with about ten dark dorsal blotches, and as many dark blue or blackish bars along the sides; the belly and interspaces between these bars are of a clear vermillion; first dorsal bright blue, with a broad median band of crimson; other fins mostly barred; D. IX—11; A. II, 7; lat. l. 58. North-

western States, Northern Ohio to Minnesota; abundant; a most brilliant species.

17. ***MICROPERCA,*** Putnam. LEAST DARTERS.

1. ***M. punctulata,*** Putnam. LEAST DARTER. Greenish olive, sides with irregular dark bars and zigzag markings; dusky lines along the rows of scales; a dark shoulder blotch; a black streak forward from eye and a vertical bar below it; D. VI to VII—9 to 12; A. II, 5 or 6; length 1¼ inches. Western States.

FAMILY XC.—PERCIDÆ.

(*The Perches.*)

Body oblong, more or less compressed, covered with rather small, strongly ctenoid scales; opercular bones mostly serrated; teeth in villiform bands on jaws, vomer and palatines; mouth slightly oblique; dorsals two, distinct, both well developed; ventrals thoracic I, 5; anal with one or two spines; branchiostegals seven; air bladder present, moderately developed; intestinal canal with a few pyloric cœca. Carnivorous fishes of moderate or rather large size, chiefly of the rivers of the Northern Hemisphere. As here restricted, a small family of about five genera and fifteen species.

* No canine teeth among the villiform ones; body compressed. PERCA, 1.

** With strong canine teeth; body elongated. STIZOSTETHIUM, 2.

1. ***PERCA,*** Linnæus. PERCHES.

1. ***P. americana,*** Schranck. COMMON YELLOW PERCH. Olivaceous, sides yellowish, with broad dark bars; head 3¼ in length; depth about the same; D. XIII—14; A. II, 7; lat. l. 63. Fresh waters E. U. S., chiefly northward and eastward. [*P. flavescens* (Mit.) Cuv.]

2. *STIZOSTETHIUM*, Rafinesque. PIKE PERCHES.

* Pyloric cœca three only, subequal, all long, about as long as the stomach; soft dorsal nearly as long as spinous dorsal; body more or less compressed. (*Stizostethium.*)

1. ***S. vitreum,*** (Mitch.) Jordan & Copeland. WALL-EYED PIKE. "SALMON." "DORY." GLASS-EYE. YELLOW PIKE. Body slender, becoming compressed with age, the back not especially depressed; dorsal spines high, more than half length of head; eye 4½ to 5 in head. General color a heavy olive, finely mottled with brassy; a large black spot on last rays of spinous dorsal, the fin otherwise nearly or quite unmarked; D. XIII—1; 21; A. II, 12; lat. l. 90. Size very large; this species reaches a length of nearly three feet, and a weight of 20 to 30 lbs. Great Lake region and some Atlantic streams, north to the Fur Countries; an abundant and valued food-fish. (*Lucioperca americana*, Cuv.)

Var. ***salmoneum,*** (Raf.) Jor. BLUE PIKE. "WHITE SALMON." Body shorter, thicker and deeper, with slenderer caudal peduncle; mouth smaller; eye larger; dorsal spines lower, 2⅓ in head; coloration bluer, with silvery instead of brassy mottlings; fin coloration darker; young pale, with traces of vertical bars; D. XIV—1, 20; A. II, 13; lat. l. 95. This species or variety is very similar to the preceding, but it is distinguished at sight by the fishermen, and seems to rarely attain a length of more than a foot. Lake Erie, Ohio River, and South.

** Pyloric cœca 4 to 7, unequal, all small (shorter than the stomach;) soft dorsal much shorter than spinous dorsal; body thick, cylindric, depressed forwards, (*Cynoperca*, Gill & Jordan.)

2. ***S. canadense,*** (Smith) Jor. SAUGER. SAND PIKE. GRAY PIKE. Body little compressed, broad across the back and rather depressed; cheeks, top of head, etc.,

usually thickly scaled; colors rather paler and more translucent than in *S. vitreum*, the shades less blended; olive gray, sides pale orange with much black mottling, the black gathered into several definite dark areas; spinous dorsal with two or three rows of round black spots; a large black blotch at base of pectorals; dorsal XII—1, 17; A. II, 12; lat. l. 95; size not large; length 12 to 15 inches. Ohio River and Great Lake region to Upper Missouri; a strongly marked species. (*L. grisea*, DeK., *L. borea*, Grd.)

FAMILY XCI.—LABRACIDÆ.

(*The Bass.*)

Percoid fishes with the general characters of the preceding family, but having three anal spines, the vertebræ and the spines of the dorsal reduced in number, generally nine or ten of the latter; teeth on the tongue in our species. Genera fifteen; species thirty-five. Mostly of northern regions, the majority of them marine, often entering rivers.

* Base of tongue with a patch of teeth; scales on head cycloid; dorsal fins not connected. . . . . Roccus. 1.

** Base of tongue toothless; scales on head ctenoid; dorsal fins united at base; second anal spine enlarged. . Morone, 2.

1. *ROCCUS*, Mitchill. Striped Bass.

< *Labrax*, Cuvier.

* Body little compressed; depth less than $\frac{1}{3}$ of length; teeth on tongue in more than one patch; chiefly marine. (*Roccus.*)

1. ***R. lineatus,*** (Bl. & Schn.) Gill. Striped Bass. Rock Fish. Silvery or yellowish, with seven or eight longitudinal bands; D. IX—1, 12; A. III, 11; lat. l. 62. Atlantic Coast, entering rivers.

** Body much compressed; depth more than $\frac{1}{3}$ of length; teeth on tongue in a single patch; fresh waters. (*Lepibema*, Raf.)

2. ***R. chrysops,*** (Raf.) Gill. WHITE BASS. STRIPED LAKE BASS. Silvery, with six or more dark stripes; sometimes "so interrupted and transposed as to appear like ancient church music." D. IX—1, 12; A. III, 13; lat. l. 55. Great Lakes, Upper Mississippi Valley and N. (*Labrax multilineatus*, *notatus*, *albidus* and *osculatii* of authors.)

2. *MORONE,* Mitchill. WHITE BASS.

< *Labrax*, Cuvier.

1. ***M. americana,*** (Gmel.) Gill. WHITE PERCH. Whitish, usually faintly striped; depth 3 in length; D. IX—I, 12; A. III, 9; lat. l. 50. Atlantic Coast, abundant also in fresh water ponds, etc., coastwise; variable. (*L. mucronatus*, *rufus* and *pallidus*, of authors.)

2. ***M. interrupta,*** Gill. SHORT-STRIPED OR YELLOW BASS. Silvery, with interrupted black stripes; D. IX—1, 13; A. III, 9. Mississippi Valley, chiefly southward. (*L. chrysops*, Grd., not of Gill.)

FAMILY XCII.—CENTRARCHIDÆ.

(*The Sun Fishes.*)

Percoid fishes with a single dorsal fin, either continuous or deeply divided, with five to thirteen spines; anal fin large, with three to nine spines; ventrals thoracic, I, 5; body oblong, more or less elevated, sometimes much compressed; opercular bones feebly if at all serrated, often with entire edges; scales scarcely ctenoid, sometimes cycloid; cleft of mouth more or less oblique; branchiostegals 6; villiform teeth on jaws, vomer and usually on palatines; many species with a small supernumerary bone lying behind the maxillary and parallel with it; others with a more or less prolonged flap extending backwards from the upper angle of the opercle; nearly all with a black spot at this point, which also covers the flap if the latter is developed; colors usually brilliant, chiefly olive green, with spots or shades of blue, yellow, orange or violet. Fresh water fishes; many of them build nests which they defend with much courage, all are carnivorous, voracious and "gamey." Genera about sixteen; species sixty; all American, and most abundant in the Mississippi Valley, every where forming a characteristic feature of our fish-fauna. The genera are quite well known, and most of them are firmly established; but the species of some groups, particularly *Xenotis* and *Lepomis* are in a state of almost inextricable confusion.

* Dorsal fin much more developed than anal fin (the base of the former 1½ to 3 times that of the latter), the soft parts of the two fins about equal, of 8 to 14 rays, and ending at the same vertical behind.

† Body elongate, not greatly compressed; spines little developed, those of the anal fin, three in number, small and weak; those of the dorsal, ten, low, the eighth and ninth quite short, so that there is a deep notch between the spinous and soft parts of the dorsal, almost breaking the continuity of the fin; caudal emarginate; operculum emarginate behind, ending in two flat points; mouth very large, the lower jaw longest; palatine teeth well developed; tongue and pterygoids toothless; gill-rakers long and stout, armed with teeth; supplemental maxillary bone well developed (*Micropterinæ*). - - - - - MICROPTERUS, 1.

†† Body comparatively short and deep, compressed; anal spines well developed; dorsal with strong spines, which are continuous with the soft rays, or at least not deeply notched (*Lepominæ*).

a. Tongue and pterygoid bones conspicuously armed with teeth; mouth large, lower jaw longest; maxillary bone broad and flat, with a strong supplemental ossicle behind it; palatine teeth well developed; gill-rakers long and strong, provided with coarse teeth; form stout and heavy.

b. Operculum emarginate behind; anal spines 5 to 7.

c. Caudal fin emarginate; scales ctenoid.

d. Tongue with a single median patch of teeth; anal spines normally 6; dorsal 10 or 11. Ambloplites, 2.

cc. Caudal fin rounded behind; scales cycloid; anal spines normally 5. . . . . Acantharchus, 3.

bb. Operculum ending behind in a convex "flap," black in color; anal spines 3; dorsal 10; caudal emarginate. Chænobryttus, 4.

aa. Tongue and pterygoid bones toothless; mouth moderate or small.

d. Operculum ending behind in an entire convex process or flap, which is always more or less black; dorsal fin not notched; dorsal spines normally 10; anal spines 3, the soft rays in each fin about 10 in number; caudal fin emarginate.

e. Maxillary with a supplemental bone; gill-rakers long, stout, dentate; mouth rather large, the lower jaw protruding; palatine teeth present; spines low; flap small. . . . . . . Apomotis, 5.

ee. Maxillary without supplemental bone; mouth rather small, with subequal jaws.

f. Lower pharyngeal bones comparatively narrow, with the teeth all conic and sharp, the outer short and small, the inner long and pointed.

g. Gill-rakers of anterior branchial arch more or less elongate, ossified, beset with small teeth. Lepomis, 6.

gg. Gill-rakers undifferentiated, all short, thickish, weak, unossified, provided with but few weak teeth; no palatine teeth; opercular flap always large, often greatly developed; coloration brilliant; spines low. . . . Xenotis, 7.

ff. Lower pharyngeal bones with the teeth or most of them rounded or truncate above, *i.e.*, teeth paved;

palatine teeth little developed, or more usually wanting.

h. Lower pharyngeals narrow, formed as in *Lepiopomus*, the teeth rounded, not truncate above; gill-rakers rather long and slender; spines rather high. . . . . . XYSTROPLITES, 8.

hh. Lower pharyngeals broad, concave, with large truncate teeth close together; gill-rakers short and thick, more or less strongly dentate; spines high. . . . . . EUPOMOTIS, 9.

dd. Operculum emarginate behind, ending in two flat points, with a dermal border; caudal fin rounded behind; gill-rakers in small number, long and strong, dentate; species of small size and brilliant coloration.

h. Dorsal fin angulated, the middle spines longer than some of the posterior ones; supplemental maxillary wanting (? or rudimentary); anal spines 3; dorsal 10. . . . . . . MESOGONISTIUS, 10.

hh. Dorsal fin continuous; supplemental maxillary bone well developed.

i. Dorsal spines 9; anal 3. . ENNEACANTHUS, 11.

ii. Dorsal spines 8; anal 4. . HEMIOPLITES, 12.

iii. Dorsal spines 10; anal 4; anal fin with an elongate basis, its anterior rays being advanced. COPELANDIA, 13.

** Dorsal and anal fins about equal in extent, the soft portions of the latter longest and most posterior, the two fins being obliquely opposed; lower jaw longest; supplemental maxillary bone present; palatine teeth present; operculum emarginate behind; gill-rakers setiform, very long, finely dentate, in large number (20 to 30 of the large ones on anterior branchial arch); fins large, the soft rays of the dorsal and anal each with 14 to 18 rays; caudal fin emarginate; scales not strongly ctenoid (*Centrarchinæ*).

j. Spinous dorsal longer than soft part, the spines about 12 in number, not rapidly graduated; anal spines normally 8; body deep; mouth moderate. . CENTRARCHUS, 14.

jj. Spinous dorsal shorter than soft part, the spines 5 to 8 in number, rapidly graduated; anal spines normally 6; body compressed and rather elongate; mouth large.
POMOXYS, 15.

1. ***MICROPTERUS,*** Lacepede. BLACK BASS.

> *Huro and Grystes*, C. & V.
= *Calliurus*, Raf. (not of Agassiz.)

1. ***M. pallidus***, (Raf.) Gill & Jor. LARGE-MOUTHED BLACK BASS. OSWEGO BASS. Dull olive green, more or less spotted when young but not barred; usually with an irregular dark lateral band, and three oblique stripes on opercles; ends of caudal fin blackish, these markings growing obscure with age; 3d dorsal spine twice as high as first; notch between spines and soft-rays deep; eight rows of scales between lateral line and dorsal; anal fin somewhat scaly; mouth very wide; D. X, 12; A. III, 10; lat. l. 65 to 70. Great Lakes and rivers of the West and South, abundant in most regions, and, like the next, highly valued as a food fish. [*Huro nigricans*, C. & V. *G. nobilior* and *nigricans*, Agass., *M. floridanus* (LeS.)]

2. ***M. salmoides,*** (Lac.) Gill. SMALL-MOUTHED BLACK BASS. MOSS BASS. Dark green; young brighter and more or less barred and spotted, but without lateral band; tail yellow at base, then black, and edged with white; opercle with oblique olivaceous streaks; third dorsal spine half larger than first; dorsal notch rather shallow; scales smaller than in the preceding—eleven rows between lateral line and dorsal; mouth smaller; anal nearly scaleless; D. X. 13; A. III, 11; lat. l. 70 to 80. Great Lakes and streams from L. Champlain S. and W.; common in N. Y. and in most regions west of the Alleganies; introduced eastward. [*G. fasciatus*, (Les.)

Ag. *C. obscurus*, DeK. (young.) *M. achigan*, (Raf.) Gill, etc., etc.]

2. AMBLOPLITES, Rafinesque. ROCK BASS.
< *Centrarchus*, Cuvier.

1. ***A. rupestris,*** (Raf.) Gill. ROCK BASS. GOGGLE EYE. RED EYE. Depth about half length; head more than one-third; eye nearly four in head, very large; cheeks scaly; front convex; longest dorsal ray two-thirds depth of head at front of orbit; brassy olive with golden green and blackish markings; a dark spot at base of each scale, which is conspicuous after death, giving a striped appearance; D. XI, 11; A. VI, 10; lat. l. 42; L. 8. Great Lakes and rivers west of the Alleganies; an abundant species. [*A. æneus*, (C. & V.) Ag. *A. ichtheloides*, (Raf.) Ag.]

2. ***A. cavifrons,*** Cope. Depth 2½ in length; mouth larger, muzzle more projecting, the front therefore concave, cheeks nearly naked; eyes still larger, 3 in head; longest dorsal ray equal to depth of head at front of orbit; silvery, dusted with dark points; scales with dark shades; D. X, 12; A. VI, 11; lat. l. 38. Roanoke R.

3. ACANTHARCHUS, Gill. BASS SUN FISHES.
< *Centrarchus*, Baird.

1. ***A. pomotis,*** (Baird) Gill. MUD SUN FISH. Elliptical; mouth large; dark greenish olive, with dull yellowish markings and longitudinal dusky streaks; opercles with dusky radiating bars; D. XI, 12; A. V, 12; L. 5. Muddy streams coastwise, N. Y. to S. C.

4. CHÆNOBRYTTUS, Gill. WAR MOUTHS.
Calliurus, Ag.

1. ***C. gulosus,*** (C. & V.) Gill. BLACK SUN FISH. Dark olive green above; sides greenish and brassy with

blotches of pale blue and bright coppery red—the latter shade predominating; belly bright brassy yellow, profusely mottled with bright red; lower jaw chiefly yellow; iris bright red, as in most Sun Fishes; opercular spot as large as eye, black, bordered with copper color; three or four wide dark red bands radiating backwards from eye across cheeks and opercles, separated by narrow pale blue ones; upper fins barred with black, orange and blue, the former color predominating, lower fins blackish; a few small faint black spots on last rays of dorsal; dorsal spines moderately high, very stout, the longest as long as from snout to middle of eye; head 2⅔ in length; depth 2⅓; eye as long as snout, 4 to 5 in head; mucous pores about head very large; body very robust, broad forwards, compressed behind; nape rounded; a depression over eye, the snout projecting, and forming an angle; fins rather low, with stout spines; mouth very large, with strong teeth, the maxillary bone very broad and flat, reaching to posterior margin of eye; tongue with one or more conspicuous patches of teeth; teeth on palatines; scales large; D. X, 10; A. III, 9; lat. l. 40. Great Lakes South and West; a fine large species having the appearance and dentition of *Ambloplites*, but with three anal spines and a rounded operculum as in *Apomotis*. (*Ch. charybdis*, Cope, *C. melanops*, Grd.) In spirits, the coloration is very dark.

2. ***C. viridis,*** (C. & V.) Jordan. Red-Eyed Bream. War-Mouth Perch. Very similar to *C. gulosus*, but differently colored—olive green, with blackish spots on the scales, and more or less reticulated; form somewhat more slender; fins, etc., the same; Virginia to Florida. (*C. gillii*, Cope.)

5. **APOMOTIS,** Rafinesque. RED EYES.

(*Telipomis*, Raf., *Bryttus*, Cuv. & Val.)

1. **A. cyanellus,** (Raf.) Jordan. BLUE-SPOTTED SUN FISH. Dark clear olive-green, each scale with a blue spot and more or less of gilt edging, the body thus appearing more or less striped along the rows of scales; colors variable, golden olive, green or even almost blue; cheeks with bright blue horizontal stripes; body more or less sprinkled with irregular dark dots; vertical fins marked with green and blue and more or less edged with pale orange; usually a distinct black dorsal spot; opercular spot small, with brassy edgings; depth $2\frac{2}{3}$ in length, head $2\frac{1}{2}$; dorsal spines low and stout; lat. l. 48; L. 4 to 6. Great Lakes, Ohio Valley and W., abundant. (*C. longulus* and *C. formosus*, Grd., *C. mineopas et melanops*, Cope.)

2. **A. phenax,** Cope & Jordan. Olive-green; body much deeper and more compressed than in *A. cyanellus;* depth $2\frac{1}{5}$ in length; spines higher; opercular flap rather long; mouth smaller, the jaws nearly equal; lat. l. 43, the scales therefore larger. New Jersey. Resembles *Lepomis* rather than *Apomotis*.

6. **LEPOMIS,** Rafinesque. SUN FISHES.

(*Lepomis*, *Ichthelis* and *Pomotis*, Raf.)

* Palatine teeth present; usually no black blotches on last rays of dorsal and anal.

1. **L. macrochirus,** Raf. CHAIN-SIDED SUN FISH. Bright steel blue, with many bronze orange spots, which cover nearly the whole surface, so arranged that the ground color forms a series of vertical chain-like bars, very conspicuous in life; vertical fins mottled with bronze, and usually more or less edged with pale orange;

no black dorsal spot; no distinct blue cheek stripes, but sides of head shaded with purplish; body rather elongate; head somewhat acute; opercular spot small; depth 2⅓ in length; head nearly 3; lat. l. 42; L. 3 to 4. Ohio Valley. A small species and one of the handsomest; extremely hardy in aquaria, and perhaps the most voracious of the Sun Fishes. (*L. nephelus*, Cope.)

2. ***L. bombifrons,*** (Ag.) Jor. Round-Faced Sun Fish. Light brown; fins pale, unspotted; belly and sides dotted with golden orange; head much broader, deeper and shorter than in any other species; the *profile being exceedingly prominent*, the forehead strongly arched, and the greatest depth immediately over the opercle; *flap very short and small;* soft rays of dorsal much higher than spines; depth 2⅕ in length, head nearly 3. Tennessee R.; rare. (May be a *Xenotis.*)

3. ***L. anagallinus,*** Cope. Red-Spotted Sun Fish. Dusky bluish, with greenish mottlings; *sides with many distinct, rather large, salmon-red spots;* belly bright salmon-red; opercular flap *rather large*, with a *very wide red margin, which entirely surrounds the black;* sometimes a black dorsal spot; spines rather high; depth 2½ in length; scales large; lat. l. 33 to 36. Arkansas to Tenn. and Kas.; a small, highly colored species.

4. ***L. oculatus,*** Cope. Coloration reddish, unspotted; body short and deep; head short; caudal peduncle and fin one-third length (more than one-third in *L. anagallinus*,) opercular flap large, with a round black spot as large as eye, surrounded by a broad white margin. Minnesota.

5. ***L. auritus,*** (L.) Raf. Long-Eared Pond Fish. Red-Tailed Bream. Sun Perch. Dusky olive; belly and vertical fins largely red; sides of body largely blue,

with rusty red spots; blue stripes on head; spines rather short; body rather elongate; *opercular flap very long*, longer than any in other species except the southern *Xenotis fallax, and extremely narrow.* Maine to Alabama, east of the Alleghenies, abundant; the only long-eared Sun-fish occurring in New England. A large handsome species, known at once by the peculiar ear-flap. L. 6 to 10. (*I. rubricauda*, *appendix*, etc., of authors.)

** No palatine teeth; dorsal spines very high; a more or less distinct black blotch on last rays of dorsal and anal. (*Helioperca*, Jor.)

6. ***L. pallidus,*** (Mit.) Gill & Jor. BLUE SUN FISH. COPPER-NOSED BREAM. Olive green, adults dark; young more or less silvery, often uniformly so in spirits; a more or less distinct purple lustre in life; sides with undulating, sometimes chain-like, transverse bars, most conspicuous in the young; *a black spot on base of dorsal and anal behind; no blue stripes on cheeks;* no red on fins; opercular flap moderately long and wide in adults, without pale edge, very short in young; body deep, compressed, caudal peduncle rather slender; head 3 in length; depth about 2; *dorsal spines very long;* D. X, 11; A. III, 10; lat. l. 40 to 45; L. 8. Great Lakes to Delaware R. (*Abbott*) and S., abundant. A large and very variable species, but almost always recognizable by the characters above emphasized. (*L. ardesiacus*, *L. megalotis*, and *L. purpurascens*, Cope, *Ichthelis incisor*, Auct.) Adult specimens are often nearly orbicular and have the belly coppery red.

7. ***L. ischyrus,*** Jordan & Nelson. A large, heavily-built species, similar to the preceding but with larger mouth, shorter spines and different coloration; top of head flat and short; opercular flap large, with a wide

pale margin entirely surrounding the black; cheeks with wide blue bands; lower jaw, etc., dull leaden blue; belly and lower fins chiefly orange. Illinois River.

8. ***L. obscurus,*** (Agassiz) Jor. BLUE-MOUTHED SUN FISH. A heavily-built, dark-colored species, chiefly blue and coppery red in life; no blue stripes on cheek; lower jaw dark leaden blue; opercular spot large, without distinct pale margin. Cumberland and Tennessee Rivers.

7. *XENOTIS,* Jordan. LONG-EARED SUN FISHES.

1. ***X. megalotis,*** (Raf.) Jor. BLUE AND ORANGE SUN FISH. SUN PERCH. *Brilliant blue and orange*, back chiefly blue, belly entirely orange, the orange forming irregular, longitudinal rows of spots, the blue in wavy vertical lines along the edges of the scales; fins with the rays blue and the membranes orange; ventral and anal shaded with dusky blue, appearing blackish when folded; *flap very large*, with a broad pale edge which is pink behind, and bluish in front; lips blue; cheeks with bright blue and orange stripes; top of head and neck blackish; eyes bright red; *spines very low*, *lower than in any other species of this genus; the longest dorsal spine shorter than from snout to middle of eye;* occiput depressed; profile high and strongly curved; depth more than half length; head with flap, a little less; eye 1½ in flap; pectorals not reaching vent; lat. l. 40. Great Lakes and Upper Mississippi River. A brilliantly colored species. (*P. nitidus*, Kirt.)

2. ***X. sanguinolentus,*** (Ag.) Jor. BLOODY SUN FISH. Similar, but rather more elongate; the spines notably higher and the blue cross-bars much more distinct. Tennessee and South, perhaps a variety.

3. ***X. aureolus,*** Jor. GILDED SUN FISH. *Pale* olive, young almost translucent; *sides and fins profusely speckled with golden orange, forming bars or chains;* orange below; cheeks with narrow blue horizontal lines; no dorsal spots; *flap moderate, rather narrow, narrowly bordered by light; forehead regularly convex, the bulk of the body thrown forward;* dorsal spines moderate; pectorals nearly reaching anal; ventrals elongate; head 3 in length, depth $2\frac{1}{8}$; eye = flap, 4 in head; lat. l. 42. Ohio Valley and W., abundant, frequenting small streams in company with the next species and with *Apomotis cyanellus.*

4. ***X. lythrochloris,*** Jor. RED AND GREEN SUN FISH. Form of *Apomotis*, the body more elongate than usual in *Xenotis;* spines very low; green above with blue spots; belly, cheeks and fins generally blood red; cheeks with blue lines; opercular flap very long, entirely black, without any pale margin. Ohio Valley, a peculiar species frequenting small brooks; size small. (*I. auritus*, Raf., not of L.)

5. ***X. inscriptus,*** (Ag.) Jor. BLUE-GREEN SUN FISH. Dark olive green, with blue shades; *many scales marked each with a short horizontal black line*, like a pencil mark, these forming faint stripes along the sides of the back; cheeks with blue lines; opercular flap *moderate, rather narrow, directed quite obliquely upwards*, bordered above and below by pinkish; spines long; depth $2\frac{1}{2}$ in length. A small handsome species, abundant in the Valley of the Ohio and S.

6. ***X. peltastes,*** (Cope) Jor. A small deep-bodied species, with large scales; caudal fin and peduncle more than one-third the *total* length; golden brown; sides somewhat spotted; belly and vertical fins largely orange;

flap rather long, with a wide red border; lat. l. 35. Michigan to Illinois.

8. *XYSTROPLITES,* Jordan. SUN FISHES.

1. ***X. heros,*** (B. & G.) Jor. A species bearing much resemblance to *Lepomis pallidus*, having the same general coloration, the black dorsal spot, the high spines, etc., but with the pharyngeal teeth more or less paved, and with the opercular flap broadly tipped with pale scarlet. Lower Mississippi Valley. *Pomotis notatus*, Ag., from Tennessee is probably the same species.

9. *EUPOMOTIS,* Gill & Jordan. POND FISHES.

(*Pomotis*, Auct. not of Raf.)

1. ***E. pallidus,*** (Ag.) Gill & Jor. PALE SUN FISH. General color olivaceous, with faint darker bars; spines high; general form, color and appearance of *Lepiopomus pallidus*, but the mouth larger, the opercular flap broadly tipped behind and below with scarlet, and the lower pharyngeals very broad, concave, covered with large, paved teeth. The gill-rakers are comparatively short and weak. Illinois to Georgia and Louisiana.

2. ***E. aureus,*** (Walb.) Gill & Jordan. COMMON SUN FISH. PUMPKIN SEED. BREAM. Depth more than half length; greenish olive above, sides orange-spotted; orange yellow below; cheeks orange with blue wavy streaks; ear-flap rounded, broadly edged with scarlet below and behind; lower fins orange, upper orange-spotted; spines rather high; D. X, 10; A. III, 9; lat. l. 37. Great Lakes and streams, chiefly northward and E. of the Alleganies; our most familiar species. (*P. maculatus*, *auritus* and *vulgaris* of authors.)

10. MESOGONISTIUS, Gill. Black-Banded Sun Fishes.

1. ***M. chœtodon,*** (Baird) Gill. Black-Banded Sun Fish. Suborbicular; depth about half length; spines long, longest equal to distance from snout to preopercle; eyes large, three in head; dirty straw color, clouded with olive; sides with four to six well-defined black vertical bars running up on the fins; first through eye, last at base of tail; D. X, 11; A. III, 12; lat. l. 28; L. 3. New Jersey to Maryland, in sluggish waters; a small, handsome species, known at once by its peculiar coloration.

11. HEMIOPLITES, Cope. Four-Spined Sun Fishes.

1. ***H. simulans,*** Cope. Four-Spined Sun Fish. Head $2\frac{3}{4}$ in length, depth $2\frac{1}{3}$; eye $3\frac{1}{4}$ in head; bright olive, with dusky stripes; sides and cheeks with purple reflections; D. VIII, 11; A. IV, 10; lat. l. 30. James R., Va. Resembles *E. obesus.*

12. ENNEACANTHUS, Gill. Nine-Spined Sun Fishes.

* Dorsal and anal moderately elevated in ♂.

1. ***E. obesus,*** (Baird) Gill. Spotted Sun Fish. Depth about half length; dark olive green, with eight strong black cross bars and purplish spots; lateral line usually incomplete; cheeks with lines and spots; opercular flap velvet black, bordered with purple; a dark bar below eye; D. IX, 10; A. III, 10; L. 3. Streams coastwise from Mass., southward; a handsome little fish.

2. ***E. margarotis,*** Gill & Jordan. Blue-Spotted Sun Fish. Body without definite blackish cross-bars, in males covered with round bright sky-blue spots; a pearly-blue spot on opercle; body more elongate than in the others; lateral line complete; D. IX, 10; A. III, 9; lat. l. 30. New Jersey to N. C. abundant.

** Dorsal and anal fins greatly elevated, in ♂ reaching middle of caudal.

3. ***E. pinniger,*** Gill & Jordan. Large-Finned Sun Fish. General color of preceding; body and fins in males with brilliant blue spots; size larger; lateral line complete; D. IX, 10; A. III, 10; lat. l. 33. Neuse River, N. C.

13. COPELANDIA, Jordan. Copelandia.

1. ***C. eriarcha,*** Jordan. A species similar in appearance to *Enneacanthus margarotis*, but with a different number of spines, a rather more elongate body and a more advanced anal, which is reached by the ventral spines; D. X, 9; A. IV, 8. Menomonee River, near Milwaukee, Wis.,—the only specimens known collected by Dr. P. R. Hoy; a singular and interesting species, connecting *Enneacanthus* with *Centrarchus.*

14. CENTRARCHUS, Cuvier. Many-Spined Bass.

1. ***C. irideus,*** (Bosc) C. & V. Shining Bass. Bright green with dark spots; vertical fins mottled; dorsal with black spot behind, which is sometimes ocellated with orange; body deep, depth half length; fins comparatively low; the ventral spine less than half length of head and not reaching vent; D. XI, 12; A. VII, 14; lat. l. 44. Illinois to Va. and South, chiefly in lowland streams.

2. ***C. macropterus,*** (Lac.) Jordan. Long-Finned Sun Fish. Similar, but more elongate, depth less than half length; ventral spine more than half length of head and reaching to about the fourth ray of anal; mouth and eye larger than in *C. irideus;* fins much higher; D. XII, 12; A. VIII, 14; lat. l. 43. With the preceding but less abundant.

15. **POMOXYS**, Rafinesque. Grass Bass.

* Dorsal spines normally 7; body much elevated; depth half length. (*Hyperistius*, Gill.)

1. ***P. nigromaculatus,*** (LeS.) Grd. Grass Bass. Calico Bass. Depth 2 in length; head nearly 3; snout projecting, forming an angle with the descending profile; mouth large, very oblique, but smaller than in the next; fins very large; anal larger than dorsal; bright olive green and silvery; sides and fins much mottled; the anal fin nearly as much variegated as the dorsal; D. VII, 15; A. VI, 18; lat. l. 41; L. 8. Great Lakes to Delaware R. (*Abbott*) and S. W.; a handsome fish. [*P. hexacanthus*, (C. & V.) Ag.]

** Dorsal spines normally 6; body less elevated; depth about one-third length. (*Pomoxys.*)

2. ***P. annularis,*** Raf. Bachelor (Ohio R.) New Light (Ky.) Crappie (St. Louis). Depth two-fifths to one-third length, scarcely greater than length of head; olivaceous, silvery below; sides with irregular clusters of dark spots; the lower part of the sides, and the anal fin usually plain; D. VII, (V to VII) 15; A. VI, 17; lat. l. 43 (39 to 48), L. 10. Mississippi Valley, a food fish of some value; abundant and exceedingly variable. (*P. storerius*, *nitidus*, *intermedius*, *protacanthus* and *brevicauda* of authors.)

FAMILY XCII. (*b.*)—ELASSOMIDÆ.

(*The Elassomes.*)

A provisional group framed for the reception of a single species whose affinities are at present uncertain. It includes small fishes similar in appearance to *Centrarchidæ*, but without lateral line, and the fins little developed; the scales cycloid, the upper jaw extremely protractile and both jaws armed with strong teeth; no vomerine teeth are apparent, and the number of branchiostegals appears to be but five. The vent is normal in its position. Vertebræ 28. Pharyngeals as in *Aphododerus*, separate, with sharp teeth.

Its nearest relationships appear to be with the *Aphododeridæ.* Two fossil genera, lately described by Prof. Cope, *Erismatopterus* and *Amphiplaga*, are perhaps allied to *Elassoma.*

* Mouth small, oblique, the lower jaw the longer; jaws apparently with but one row of stout conical teeth; dorsal spines five; anal spines three; branchiostegal membranes broadly connected across the chest; body elongate, compressed; caudal fin rounded; cheeks and opercles scaly; bones of head entire. ELASSOMA, 1.

1. ELASSOMA, Jordan. ELASSOMES.

1. ***E. zonata,*** Jordan. Head 3 in length; depth $3\frac{1}{2}$; olive green, finely punctate, sides with eleven dark vertical bands; a distinct round black spot behind the shoulder, D. IV, 10; A. III, 6; length of specimens known, one inch. Lower Mississippi region and S. W.; specimens seen from Arkansas and Texas.

FAMILY XCIII.—APHODODERIDÆ.

(*The Pirate Perches.*)

Vent anterior, usually in front of the ventral fins; dorsal fin single, high, with but three or four spines; ventrals thoracic, without spines and with seven soft rays; preorbital, preopercle and other bones of head strongly serrated; teeth on jaws and palate; scales ctenoid; branchiostegals six; cœcal appendages about twelve; air bladder simple.

The two species known inhabit lowland waters, and are remarkable for their voracity and for their nocturnal habits. The unusual position of the vent (as in *Amblyopsidæ*) distinguishes them widely from the Percoid fishes.

The relations of this group are obscure. It much resembles the Haplomi, and is perhaps as near to *Umbridæ* as to *Centrarchidæ.* Although the vent is normally jugular, specimens occur with the vent variously posterior. On specimens with the vent between the ventral fins, the genus *Asternotremia*, Nelson was based. Others have the vent even farther back. From the observations of Prof. S. A. Forbes, it appears that in this group the position of the vent is not a generic character—not even specific, and that the four nominal species, *Aphododerus sayanus* and *A. cookianus*, and *Asternotremia isolepis* and *A. mesotrema*, are to be reduced to one species of one genus.

1. **APHODODERUS,** LeSueur. PIRATE PERCHES.

1. ***A. sayanus,*** (Gilliams) DeK. PIRATE PERCH. Head 3¼ in length; depth 3¾; greenish olive; a suborbital bar, and dark bars at base of caudal; caudal rounded; lower jaw longest; D. IV, 11; A. II, 7; lat. l. 50 to 55; length 5 inches. N. Y. to La., in brooks near the coast; also throughout Mississippi Valley in sloughs and bayous.

NOTE.—The position of the vent in this family varies with *age;* the young having the vent behind the ventrals, the adult in front —the difference being due to the prolongation of the rectum.

FAMILY XCIV.—SCIÆNIDÆ.

(*The Maigres.*)

Body compressed, often elongate, covered with ctenoid scales; lateral line continuous, often running up on the caudal fin; teeth in villiform bands, sometimes with canines; vomer and palate toothless; opercles weakly if at all serrated; bones of skull more or less cavernous, with muciferous system highly developed; chin usually with pores or barbels; lower pharyngeals distinct, except in *Haploidonotus* and its relatives, where they are firmly united (pharyngognathous) as in the *Labridæ;* dorsals two, distinct or slightly connected, the soft part most developed; vertical fins usually scaly; ventrals I, 5, thoracic; anal spines generally 1 or 2; air bladder large and often complicated (rarely wanting); stomach cœcal, with a few pyloric appendages.

Chiefly marine, in temperate and warm regions, the following only in fresh water. Genera about twenty; species one hundred and ten, numerous on our coasts:

* Lower jaw shorter, received within the upper; both jaws fully provided with teeth; no canines; lower pharyngeals united. (HAPLOIDONOTINÆ.)

† Body moderately elevated; depth about one third length; caudal double-truncate, slightly prolonged behind. HAPLOIDONOTUS, 1.

†† Body greatly elevated at the shoulders; depth nearly half length; caudal truncate, . . EUTYCHELITHUS, 2.

1. *HAPLOIDONOTUS,* Rafinesque. BUBBLERS.

= *Amblodon,* Raf.

1. ***H. grunniens,*** Raf. SHEEPSHEAD (Lakes). WHITE PERCH. GRUNTER. DRUM. Depth 3 in length; head 3½; back elevated forwards, and much compressed; spines strong; first anal spine short; the second very large,

attached to a stout bone; grayish silvery, dusky above; scales rather large and irregularly placed, punctate with black; D. IX—I, 30; A. II, 7; lat. l. 54. Great Lakes, Mississippi Valley, etc., abundant. (*Corvina oscula* and *C. grisea*, of authors.) Three other species of this genus have been described but their validity is extremely doubtful. Southward this species is considerably valued as food, but in the Great Lakes its flesh is ill-scented and worthless. The large "ear-bones" of this species are marked with a rude "*L*," and are highly valued by Wisconsin boys as "lucky stones."

2. *EUTYCHELITHUS,* Jordan. LAKE HURON DRUMS.

1. ***E. richardsonii,*** (C. & V.) Jordan. MALASHEGANAY. LAKE DRUM. Head and shoulders much elevated; profile very steep; eye moderate; mouth rather large; the lower jaw rather projecting; head nearly one-third of length; depth about one-half; anal spine stout (single?), one-third shorter than the soft rays; pectorals pointed, much longer than the ventrals; opercular bones all finely serrated; greenish with dark bands on the back; D. IX—I, 29; A. I, 7; lat. l. 54. Lake Huron. (I retain this genus with much doubt. No specimens except the original type are known, and this may have been merely a monstrosity of the ordinary *Haploidonotus grunniens*.)

FAMILY XCV.—COTTIDÆ.

(*The Sculpins.*)

Fishes with the cheeks mailed (*i. e.*, the suborbital bone extending backward over the cheeks, articulating with the preopercle); head broad, usually not externally bony, but always more or less spinous; eyes high up, near together; body sometimes scaly, or with a series of bony plates, naked in all our species; dorsals usually two, soft dorsal largest; pectorals large, without detached rays; ventrals thoracic, near together, usually imperfect, but developed in all our species; air bladder usually absent. Genera about twenty; species about 70. Mostly of the shores of northern regions; several small species abounding in the fresh waters of Europe, Asia and North America. In habits these fresh water species bear a strong resemblance to the *Etheostomoids*. All of them are singular looking fishes, and many of the marine species are hideous in appearance.

OBS.—In the measurements given below, the total length of the body is understood *inclusive* of the caudal fin, not to base of caudal as in other cases.

* Second dorsal moderately elevated, not remote from the first; preopercle with 1 to 3 spines.

† No teeth on the palate (pharyngeal teeth present, as usual); ventrals 1, 3; size small (length 2 to 3 inches). URANIDEA, 1.

†† Palate with teeth; ventrals 1, 4; size usually larger (length 3 to 6 inches).

‡ Skin smooth, excepting usually a small patch of minute spines in the axils of the pectorals. POTAMOCOTTUS, 2.

‡‡ Skin beset, especially above the lateral line, with small hooked prickles; preopercle armed with a strong sharp spine, curved like a cow's horn; back sub-carinate; caudal peduncle slender. . . . . . TAURIDEA, 3.

*** Second dorsal very high, widely separated from the first; preopercle with 4 needle-like spines. . . TRIGLOPSIS, 4.

1. *URANIDEA*, DeKay. MILLER'S THUMBS.

< *Cottus*, Girard.

* Slender, fusiform species; depth 6 to 6½ in length.

1. ***U. gracilis***, (Heckel) Putnam. MILLER'S THUMB. LITTLE STAR GAZER. Tips of pectorals reaching fourth ray of second D., and first of anal; head 4 in total length; eye 4 in head; grayish, mottled. D. VIII—16,

A. 11 or 12. New England and New York; the common Eastern species, found "quiescent" under stones, after the manner of the Darters. (*U. quiescens*, DeK.) [*U. boleoides* (Grd.), from Vermont, is said to be slenderer, and with larger fins. *U. formosa*, (Grd.) from stomachs of *Lota*, in deep water, L. Ontario, is more elongate, with shorter fins; it needs further examination. *U. gobioides*, (Grd.) is larger, much stouter and with larger mouth. It is from La Moille R., W. Vt.]

2. ***U. kumlieni,*** Hoy. KUMLIEN'S COTTUS. A slender species, with the head 3⅓ in length (without caudal); pectorals falling just short of anal; preopercular spine large, directed upwards and backwards, not much hooked; dorsals and anal high; D. VI—17; A. 12. Lake Michigan—in deep water.

** Stouter; depth about 5½ in total length.

2. ***U. viscosa,*** (Haldeman) Cope. SLIPPERY MILLER'S THUMB. Pectorals scarcely reaching second dorsal; head 4½ in total length; eye 5 in head; body subcylindrical, covered with a viscid skin; dusky, mottled; D. VIII—17; A. 12. Streams of Penn., Md., Va., etc., frequent, often found in caves. (*C. copei*, Abbott.)

3. ***U. franklini,*** (Ag.) Jordan. FRANKLIN'S COTTUS. Pectorals scarcely reaching second dorsal; first dorsal scarcely lower than second; head 3⅔ in total length; eye 4⅓ in head; D. VIII—17; A. 12. S. and E. shores of L. Superior.

4. ***U. hoyi,*** Putnam. HOY'S BULL-HEAD. Body small, short and thick; head 3⅓ in length, without caudal; preopercle with a prominent, sharp, straight spine directed backwards; below this a prominent spine directed downwards, and one or two minute spines still lower; mouth

contracted, with the lower jaw projecting; eyes very large $3\frac{2}{3}$ in head; ventral fins long, reaching about to vent; D. VI—15; A. 11; L. $2\frac{1}{6}$. Lake Michigan—in deep water.

2. POTAMOCOTTUS, Gill. Blobs.

1. ***P. meridionalis,*** (Grd.) Gill. Cave Bull-Head. Goblin. Blob. Muffle-Jaws. Head $3\frac{1}{3}$ in length; depth 5; width of head $3\frac{1}{2}$; P. reaching beyond beginning of soft dorsal, to anal; preopercle with a stout erect spine and two smaller ones below; mouth wide; palatine teeth unusually strong; lateral line very distinct, chain-like, sometimes vanishing behind, and sometimes not. Grayish, mottled, three cross blotches on back; D. VI to VIII—16; A. 12 or 13; V. 1, 4. N. C. to Ala., Tenn., and Ind., abounding in many of the streams issuing from the caves in the limestone region; the largest species of the genus, reaching a length of 6 inches. (*C. meridionalis*, Grd. *P. carolinæ*, Gill., *P. zopherus*, Jor.)

2. ***P. richardsonii,*** (Ag.) Gill. Lake Superior Miller's Thumb. Pectorals shorter than head, scarcely reaching second dorsal; depth 6 in total length; head $4\frac{1}{4}$; eye $5\frac{1}{2}$ in head; vent near the middle of total length; D. VIII—18; A. 14. L. Superior; one of the largest species.

3. ***P. bairdii,*** (Girard) Gill. Baird's Bull-Head. Pectorals long, reaching beyond beginning of anal; depth 6 to $6\frac{1}{2}$ in total length; spinous dorsal very low, with a black bar; head $4\frac{1}{4}$ in length; eye 4 in head; D. VI to VII—16; A. 13. Ohio, etc.

4. ***P. alvordii,*** (Grd.) Gill. Similar to the preceding but stouter, with the pectorals rather shorter, and the dorsal spines higher, 7 or 8 in number; color dark, variegated;

spinous dorsal with two black spots; D. VII—16; A. 13. Rivers, Mich. to Ills. and Minn.

5. ***P. wilsoni,*** (Grd.) Gill. WILSON'S BULL-HEAD. Rather larger than the last; spinous dorsal higher; and the *upper rays of the pectoral fins branched;* Pennsylvania to Indiana.

3. *TAURIDEA,* Jordan & Rice. COW-FACED SCULPINS.

1. ***T. spilota,*** (Cope) Jordan & Rice. RICE'S SCULPIN. Head and body elongate, depressed; head 3⅗ in length; without caudal; body abruptly contracted opposite base of anal, forming an extremely slender caudal peduncle; head very broad and flat, as broad as long; the profile rising rapidly from occiput to dorsal, which runs along a sort of keel; eyes close together, entirely superior; preopercular spine extremely large, hooked backwards, and slightly spiral, giving to the physiognomy a wonderful resemblance to that of a cow; three spines hooked downwards below the large one, the lower concealed; base of opercle with a strong spine directed downwards; head smooth; space above lateral line behind head covered with small stiff prickles, visible as small black specks when the skin is dry; no spines in the axillary region; coloration quite unlike that of our other Cottoids; pale brown, finely speckled and mottled with darker; belly white; D. VIII—17; anal 12; ventrals I, 4. Lake Michigan and tributaries—in deep water. (*Cottopsis ricei*, Nelson; *Uranidea spilota*, Cope.) This species has been thus far referred to as a *Cottopsis*, but it has little affinity with *C. asper*. *Cottopsis* has essentially the character of *Potamocottus*, but the skin above is densely villous, covered thickly with short velvety projections.

In *Tauridea*, the prickles are much less numerous, but are longer and stiffer. The coloration and form of the body are essentially the same in *Cottopsis* and *Potamocottus*, in *Tauridea*, quite different. Perhaps these three genera should all rather be considered as subgeneric sections of *Uranidea*.

3. *TRIGLOPSIS*, Girard. LAKE SCULPINS.
= *Ptyonotus*, Günther.

1. ***T. thompsoni***, Grd. DEEP WATER LAKE SCULPIN. Body elongate; depth 7 in total length; head 3½; eyes very large, 4 in head; D. VI—18; A. 15. Great Lakes (L. Ontario, L. Michigan) in deep water; till lately known only from remains found in the stomachs of Lake Trout and Ling.[1]

FAMILY XCVI.—GOBIIDÆ.

(*The Gobies.*)

Body elongated, low, naked or scaly; dorsals two, sometimes united, the spines flexible and less developed than the soft rays; anal similar to soft dorsal; ventrals 1, 5 (rarely 1, 4), sometimes united, forming a disk; gill openings narrow; teeth generally small; a prominent papilla near the vent, as in the Blennies; air bladder usually wanting; no pyloric appendages. Genera thirty; species three hundred and twenty-five. Of the seas of temperate and tropical regions, found on the bottoms near the shore. A few species inhabit both salt and fresh water.

* Body naked; ventrals united. . . . GOBIOSOMA, 1.

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[1] NOTE.—The number of species of fresh water Cottoids as here given is much too great, as not more than seven of them are certainly distinguishable. The current genera might with little violence be all reunited to *Cottus*.

1. ***GOBIOSOMA,*** Girard. NAKED GOBIES.

1. ***G. molesta,*** Grd. Dusky brown; head 3½ in length; D. VII—12; A. 12. Coast of Texas, entering rivers. A single specimen in the Museum of Comp. Zoölogy from the Ohio R., near Louisville (*Putnam.*)

SUB-ORDER.—ANACANTHINI.

(*The Jugular Fishes.*)

FAMILY XCVII.—GADIDÆ.

(*The Cod Fishes.*)

Body elongated, covered with small smooth scales; dorsal fins 1, 2 or 3, occupying most of the back; rays of posterior part well developed; vertical fins never entirely united (as in some related families); ventrals jugular, usually several-rayed; gill openings wide; air bladder usually present; no pseudobranchiæ; pyloric cœca usually in large numbers (30 or more in *Lota*). Genera about twenty-five; species about seventy. An important family, found chiefly in the northern seas; a single genus inhabiting the lakes and larger streams of the northern parts of Europe and America.

* Chin with a barbel; dorsals 2; anal single; teeth villiform. LOTA, 1.

1. ***LOTA,*** Cuvier. LINGS.

1. ***L. maculosa,*** (LeS.) Cuv. LING. BURBOT. LAKE LAWYER. EEL-POUT. LAKE CUSK. Dark olive, thickly marbled with blackish; yellowish or dusky beneath; head broad, depressed; body sub-cylindrical in front, compressed behind; upper jaw (usually) longest; D. 13—76; A. 68; V. 7; length 1½ to 2½ feet. Great Lakes and streams of New England, north to the Arctic Circle,

abundant; rather rare in the Miss. Valley. A curious fish, rarely used for food, although the livers are said to be delicious. [*L. maculosa*, (Les.) Cuv. *L. compressa*, (Les.) and *L. brosmiana*, Storer. *L. inornata*, DeK., etc.] The common European species (*L. vulgaris*, Cuv.) seems to be the same, but the American name, *maculosa*, is the older.

SUB-ORDER.—HEMIBRANCHI.

(*The Half-Gilled Fishes.*)

FAMILY XCVIII.—GASTEROSTEIDÆ.

(*The Sticklebacks.*)

Small fishes with the body elongated and compressed; caudal peduncle very slender; mouth large, with the cleft oblique; villiform teeth on jaws and pharyngeals; branchiostegals three; opercles unarmed; sub-orbital bone articulated with the preopercle (as in *Cottidæ*, with which these fishes were formerly associated); skin naked or with bony plates; dorsal preceded by two or more isolated spines; ventrals abdominal, of a stout spine, accompanied by a rudimentary ray; air bladder simple; a few pyloric cœca. Genera about five; species twenty-five or less, in fresh waters and arms of the sea in northern Europe and America.

* Dorsal with 2 to 6 free spines.

† Sides mailed; a serrated bony ventral cuirass and usually a bony caudal keel; dorsal spines not in a right line. GASTEROSTEUS, 1.

†† Sides naked; no caudal keel; ventral cuirass reduced, not serrated.

‡‡ Dorsal spines not in a right line when erected, the anterior ones highest; ventral plates 2—not on median line; caudal peduncle very slender. . . APELTES, 2.

‡‡ Dorsal spines in the same line, the lowest in front; ventral plate single, on the middle line of abdomen; caudal peduncle stouter. . . . . . . EUCALIA, 3.

** Dorsal spines 7 or more; sides mailed or not; dorsal spines not in a right line. . . . . . . PYGOSTEUS, 4.

1. GASTEROSTEUS, Linnæus. MAILED STICKLEBACKS.

1. ***G. noveboracensis,*** C. & V. NEW YORK STICKLEBACK. Maine to Cape Hatteras, coastwise; sometimes ascending streams.

2. APELTES, DeKay. NAKED STICKLEBACKS.

< *Gasterosteus*, L.

1. ***A. quadracus,*** (Mitch.) Brevoort. FOUR-SPINED STICKLEBACK. Abundant, with the preceding.

2. EUCALIA, Jordan. NEST-BUILDING STICKLEBACKS.

1. ***E. inconstans,*** (Kirtland) Jordan. BROOK STICKLEBACK. OHIO STICKLEBACK. Head about 3½ in length; depth nearly 4; spines rather low; ventral spine about equal to eye; color olivaceous, marbled with darker; males in spring jet black, finely punctate; D. III to V—I, 10; A. I, 10; length 2½ inches. Ohio to Minnesota and Kansas, chiefly northward; abundant in sluggish streams; an interesting species, remarkable for its pugnacity and for its nest-building habits.

Var. ***pygmœa,*** (Agassiz) Jordan. LAKE SUPERIOR STICKLEBACK. Depth 3¾ in length; head 3½; caudal peduncle short and stout; body shorter and deeper than in the preceding; vent much nearer tip of caudal than snout; color similar; D. III or IV—I, 6; A. I, 6. L. Superior.

Var. ***cayuga,*** Jordan. CAYUGA LAKE STICKLEBACK. Head 3⅓ in length; depth 4¼; spines all high; caudal peduncle slender; vent much nearer snout than tip of caudal; D. IV—I, 10; A. I, 10. Cayuga L., N. Y., dredged in deep water (*Wilder*). Probably this and the preceding are varieties of the variable *E. inconstans*. Length 1¼ inches.

4. PYGOSTEUS, Brevoort. MANY-SPINED STICKLEBACK.

1. ***P. occidentalis,*** (C. & V.) Brevoort. TEN-SPINED STICKLEBACK. Coastwise, abundant; sometimes ascending streams.

Var. ***nebulosus,*** (Ag.) Jordan. MANY-SPINED LAKE STICKLEBACK. Head 3½ in length; ventral spine long; caudal keeled; sides not mailed; silvery, much clouded with olive; D. IX—10; A. I, 8. Great Lakes (not distinct from preceding except in its fresh-water habits.)

2. ***P. mainensis,*** (Storer) Brev. MAINE STICKLEBACK. Sides with a serrated plate; body banded; D. VII—I, 9; A. I, 8. Kennebec R., Maine.

SUB-ORDER.—PERCESOCES.

(*The Silversides.*)

FAMILY XCIX.—ATHERINIDÆ.

(*The Silversides.*)

Body elongated, more or less compressed, covered with rather small cycloid scales; sides with a bright distinct silvery band in all known species; dorsal spines flexible and feeble; teeth small, numerous. Small, carnivorous fishes of warm regions, usually swimming in schools near the shore; a few species in permanently fresh water. Genera about five; species forty-five.

Besides the following strictly inland species, the common Dotted Silverside [*Chirostoma notatum* (Mitch.) Gill] ascends rivers from the sea.

* Mouth very oblique; the upper jaw plane above, concave within; the lower jaw correspondingly convex, the protractile inter maxillaries forming a peculiar roof-like beak. - - - LABIDESTHES, 1.

1. LABIDESTHES, Cope. RIVER SILVERSIDES.

1. ***L. sicculus,*** Cope. SILVER SKIP-JACK. RIVER SILVERSIDE. Depth 6 in length; head $4\frac{1}{2}$; eye $3\frac{1}{2}$ in head; anal long, nearly one-third of length of body; scales small; pale olive, translucent, dotted with black, the silver lateral band very distinct; D. IV–11; A. I, 23; lat. l. 75; length 3 to 4 inches. Western streams and ponds, Mich. to Ills. and Tenn.; abundant where found, but not noticed till comparatively lately. A very slender and elegant species of delicate organism. The peculiar "duck-like muzzle" is said to resemble that of some *Cyprinodonts*, especially the Central American *Belonesox.*

SUB-ORDER.—HAPLOMI.

(*The Toothed Minnows.*)

FAMILY C.—CYPRINODONTIDÆ.

(*The Cyprinodonts.*)

Head and body scaly; no barbels; margin of upper jaw formed by intermaxillaries only; teeth in both jaws and on pharyngeals well developed; dorsal fin far back; caudal usually rounded; no adipose fin; lateral line rudimentary; air bladder simple; no pyloric cœca; head more or less flattened above, the lower jaw usually longer; sexes commonly unlike, the female larger; anal of male often modified into a sword-shaped intromittent organ; chiefly viviparous.

Small fishes of fresh or brackish waters in both continents; most abundant in warm regions. Genera twenty-five; species one hundred and twenty. A recently discovered *Cyprinodont* (*Protistius*, Cope) from S. A. is said to have a rudimentary spinous dorsal fin, indicating a close relationship between this family and the *Percesoces*.

Our numerous species are not well known, and the current genera are but indifferently characterized. One species (*Girardinus formosus*) from S. C. and Florida is said to be the smallest known vertebrate. The species here mentioned are carnivorous surface swimmers; many southern species feed on mud and slime.

* Intestinal canal short, but little convoluted; bones of each mandibilary firmly united; carnivorous species; anal fin not modified into an intromittent organ; ventrals present.

† Teeth in a single series, incisor-like, notched; dorsal nearly over ventrals; body stout and deep. CYPRINODON, 1.

†† Teeth all pointed, in bands.

a. Dorsal fin beginning in advance of anal.

b. Branchiostegals 6. . . . . HYDRARGYRA, 2.

bb. Branchiostegals 5. . . . . FUNDULUS, 3.

aa. Dorsal beginning directly opposite anal; both fins large; branchiostegals 4; coloration peculiar. XENISMA, 4.

aaa. Dorsal beginning behind origin of anal; branchiostegals 5 . . . . ZYGONECTES, 5.

1. *CYPRINODON,* Lacepede. MUMMICHOGS.

1. ***C. variegatus,*** Lac. The common coastwise species, entering streams.

2. *HYDRARGYRA,* Lacepede. MAY FISHES.

1. ***H. majalis,*** (Bloch & Schn.) C. & V. The common coastwise species—largest of our *Cyprinodontidæ*.

3. FUNDULUS, Lacepede. KILLIFISHES.

1. ***F. diaphanus,*** (Les.) Ag. BARRED KILLIFISH. SPRING MUMMICHOG. Sides silvery olive, with twelve to fifteen distinct, narrow, blackish, vertical bars; head rather narrow; D. 13; A. 13; lat. l. 42. Coastwise, abundant, but ascending streams to their sources, hence found in clear springs as far inland as Mich. (*Cope*), Wisconsin (*Copeland*), Illinois, Colorado (*Yarrow*), etc. [*F. multifasciatus*, (Les.) Val.]

2. ***F. menona,*** Jordan & Copeland. Similar but larger, and the vertical bars bluish white on a darker ground. D. 12; A. 10; lat. l. 48. Rock River, Wis.

3. ***F. heteroclitus,*** (L.) Gthr. A common species of the coast, ascending streams; D. 11; A. 11; lat. l. 35.

4. ***F. nigrofasciatus,*** (LeS.) C. & V. D. 10; A. 9; lat. l. 33; males with numerous silvery cross bars; females with black ones. With the preceding.

4. XENISMA, Jordan. STUD FISHES.

1. ***X. catenata,*** (Storer) Jordan. STUD FISH. MAY FISH. Pale steel blue, sides with series of bright bronze spots, forming very distinct longitudinal streaks; head with bright green stripes; ♀ dull; throat and bars on dorsal and anal bright orange; D. 14; A. 15; lat. l. 47; length 6 inches. Tenn. R.; one of the handsomest of the family. (*X. stellifera*, Jor., from Alabama River, with the spots not in rows, is a still more brilliantly colored species.)

5. ZYGONECTES, Agassiz. TOP MINNOWS.

< *Haplochilus*, Günther.

* Body elongate, rather slender. (*Zygonectes.*)

1. ***Z. notatus,*** (Raf.) Jor. BLACK-SIDED KILLIFISH. TOP MINNOW. Depth $4\frac{1}{2}$ in length; head 4; head broad, depressed; clear pale olive with a few dots above; a wide purplish-black band along sides from snout through eye to caudal, its margin usually serrated; D. 9; A. 11; lat. l. 34; length $2\frac{1}{2}$ inches. Miss. Valley; abundant (*Z. pulchellus* and *tenellus*, Grd., *F. aureus*, Cope, *Z. olivaceus*, Ag., etc.)

** Body short, deep, much compressed. (*Micristius*, Gill.)

2. ***Z. nottii,*** Agassiz. STRIPED TOP MINNOW. A broad band and several dotted lines along sides; the darker continuous bands alternating with fainter interrupted ones; males transversely banded; silvery below. Mississippi Valley and Southern streams.

3. ***Z. melanops,*** (Cope) Jordan. Yellowish brown; belly golden; a black spot below eye; fins dotted; D. 6; A. 8; lat. l. 31. Neuse R. to Illinois.

4. ***Z. dispar,*** Ag. STRIPED MINNOW. Depth $4\frac{1}{3}$ in length; head $3\frac{3}{4}$; the width of interorbital space $\frac{3}{4}$ length of head; the width between the eyes above nearly twice as great as below; snout broadly rounded; fins small; D. 7; A. 9; lat. l. 34; color bluish, each scale with a bronze spot forming very regular longitudinal lines, which are very distinct; males with dark cross bars; very small; L. $1\frac{1}{2}$. Rivers and lakes of Indiana and Illinois, a singular and handsome species.

FAMILY CI.—UMBRIDÆ.

(*The Mud Minnows.*)

Small fishes like the *Cyprinodonts* in most respects, but with the mouth different; margin of upper jaw formed by the intermaxillaries mesially and by the maxillaries laterally; head and body scaly; no lateral line;

scales moderate, cycloid; lower jaw longest; dorsal far back; caudal fin rounded; gill openings wide; teeth villiform, on jaws, vomer and palatines. Genus one (or two); (*Melanura* has never been properly distinguished from *Umbra*); species two, *Umbra crameri* of Austria and the following. Both are found in sluggish brooks in mud or among weeds. "A locality which, with the water perfectly clear, will appear destitute of fish, will perhaps yield a number of mud fish on stirring up the mud at the bottom and drawing a seine through it. Ditches in the prairies of Wisconsin, or mere bog-holes, apparently affording lodgment to nothing beyond tadpoles, may thus be found filled with *Melanuras*." (*Baird*.)

1. ***MELANURA,*** Agassiz. Mud Minnows.

< *Umbra*, Günther.

1. ***M. limi,*** (Kirtland) Agassiz. Mud Minnow. Mud Dace. Dog Fish. Depth about 4 in length; head 3½; head rather large, flattish above; greenish or dark olive; sides with narrow pale bars, often obscure; a distinct black bar at base of caudal; D. 14; A. 9; V. 6; lat. l. 35; length 2 to 4 inches. Lake Champlain to Minnesota, chiefly northward and westward; most abundant in Wisconsin; rare in Ohio Valley; usually associated with *Eucalia inconstans*.

2. ***M. pygmœa,*** (DeK.) Baird. Eastern Mud Minnow. Dark brown with whitish longitudinal streaks and no trace of cross bars; body less compressed than in *M. limi;* head broader, less depressed, with larger eye; snout shorter; profile more gibbous; D. 13; A. 7; lat. l. 35. New York to S. C., only in Atlantic streams.

FAMILY CII.—ESOCIDÆ.

(*The Pikes.*)

Body elongated, sub-cylindrical, with rather small scales; margin of upper jaw formed by intermaxillaries mesially and by the maxillaries laterally; mouth very large; jaws elongate, depressed; teeth strong, hooked, unequal, on intermaxillaries, vomer and palatines; dorsal short, opposite anal; gill openings wide; air bladder present. Voracious fishes of the fresh waters of northern regions, two or three of the species reaching a large size. With a single exception (*E. lucius*, L. the Pike of Europe and Asia) all the species belong to the U. S.

Genus one; species six or seven; the following seem to be well characterized; many others have been described and some of them may be good, but that has yet to be proven.

1. ***ESOX,*** Linnæus. Pikes.

* Lower half of *cheeks* as well as opercles bare; branchiostegals 17 to 19; species of very large size, *dark-spotted* on a lighter ground. (*Muskallunges.*)

1. ***E. nobilior,*** Thompson. Muskallunge. Great Pike. Cheeks as well as opercles half bare; grayish with round black spots; a magnificent fish, reaching a length of 6 feet; B. 18; D. 3, 17; A. 3, 15; lat. l. 155. Great Lakes, etc. (*E. estor* of some authors.)

** Lower half of cheeks scaly; of opercles bare; branchiostegals 15 or 16; species of large size, white-spotted on a darker ground. (*Pikes.*)

2. ***E. lucius,*** L. Great Lake Pike. Northern Pickerel. Cheeks entirely scaly; depth 7 in length; head 3½; olive gray; sides with round yellowish spots as large as peas; each scale with a shining V-shaped mark opening downwards; B. 15; D. 20; A. 17; lat. l. 122.

Great Lakes and headwaters of the Mississippi. A fine species reaching a length of 3 to 4 feet. (*E. estor*, *lucioides*, *boreus*, etc., of authors.)

*** Cheeks and opercles scaly; branchiostegals 12 to 15; species of moderate or small size, reticulated or barred with dark green on a lighter ground—sometimes plain. (*Pickerels.*)

† Branchiostegals 14 to 16; snout prolonged; front of eye nearly midway in head.

3. ***E. reticulatus,*** LeSueur. Common Eastern Pickerel. Green Pike. Head $3\frac{1}{8}$ in length; the snout much prolonged; front of eye about midway in head; eye more than three times in snout; green, sides with a network of brown streaks; B. 14 to 16; D. 16 to 18; A. 15 to 17; lat. l. 120 to 130. Streams of Atlantic States abundant, but not found far in the interior; smaller than the preceding, but much larger than the next.

†† Branchiostegals normally 12; front of eye nearer tip of snout.

4. ***E. cypho,*** Cope. Hump-back Pickerel. Resembles *E. salmoneus*, but may probably always be known by the elevated back and broad swollen ante-dorsal region. Colors usually plain or somewhat reticulate. Western States.

5. ***E. americanus,*** Gmelin. Banded Pickerel. Trout Pickerel. Head $3\frac{3}{5}$ in length, the snout much shorter than in the preceding; eye much nearer snout than opercular margin, its diameter less than 3 in snout; dark green; sides with about twenty distinct blackish curved bars, scarcely reticulated; B. 12; D. 13; A. 13; lat. l. 100; length scarcely a foot. Atlantic streams, with the preceding. (*E. niger*, *scomberius*, *fasciatus* and *ornatus* of authors.) (Represented S. of Va. by *E. ravenelii*, Holbr.)

6. ***E. salmoneus,*** Raf. LITTLE PICKEREL. WESTERN TROUT PICKEREL. Size and general form of preceding or slenderer; olivaceous green above; white below; sides with many reticulations and curved streaks, instead of bars; a black streak in front of eye as well as below; B. 12; D. 13; A. 14; lat. l. 112. Western streams, abundant in the Ohio Valley. (*E. umbrosus*, Kirtland.) Resembles *reticulatus* more than *americanus*.

FAMILY CIII.—AMBLYOPSIDÆ.

(*The Cave Fishes.*)

Fishes with the ventral fins rudimentary or wanting; the vent jugular, in front of the pectorals, and the eyes sometimes rudimentary and concealed under the skin; margins of upper jaw formed by intermaxillaries alone; head naked; body with small, cycloid scales, irregularly arranged; no lateral line; villiform teeth on jaws and palate; dorsal far back, opposite anal; stomach cœcal, with pyloric appendages; some (and probably all) viviparous.

Fishes of small size living in subterranean streams and ditches of the central and southern U. S. Three genera and four species are "all of the family yet known, but that others will be discovered and the range of the present known species extended is very probable. The ditches and small streams of the lowlands of our Southern Coast will undoubtedly be found to be the home of numerous individuals, and perhaps of new species and genera, while the subterranean streams of the central portion of our country most likely contain other species." (*Putnam.*)

* Eyes rudimentary, concealed under the skin; body colorless.

Ventrals present, small. . . .	AMBLYOPSIS, 1.
Ventrals entirely wanting. . .	TYPHLICHTHYS, 2.

** Eyes well developed; body colored; no ventrals.
CHOLOGASTER, 3.

1. AMBLYOPSIS, DeKay. LARGER BLIND FISH.

1. ***A. spelœus,*** DeKay. BLIND FISH OF THE MAMMOTH CAVE. Head 3 in length; D. and A. equal, well developed; head and body with papillary ridges; scales small; colorless; D. 10; A. 9; V. 4; P. 11; length 2 to 5 inches. Subterranean streams of Ky. and Ind., Mammoth Cave, Wyandot Cave, etc.

2. TYPHLICHTHYS, Girard. SMALL BLIND FISH.

1. ***T. subterraneus,*** Grd. General character of Amblyopsis, but the head rather blunter and broader forwards; D. 7 or 8; A. 7 or 8; P. 12; length 2 inches or less. Subterranean streams in Ky., Tenn., Ala.

3. CHOLOGASTER, Agassiz. DITCH FISHES

1. ***C. cornutus,*** Ag. Head 3 in length; eye moderate, well developed; snout with two horn-like projections; yellowish brown, dark above; sides with three dark lines, becoming dots on the tail; middle rays of C. dark, fins otherwise uncolored; D. 8 or 9; A. 8 or 9; P. 12; length 2 to 2½ inches. Ditches in a rice field, Waccamaw, S. C. Three specimens known.

2. ***C. agassizii,*** Putnam. Head 4 in length; eyes larger; uniform light brown, otherwise as above; length 1 to 2 inches. Subterranean streams in Tenn. and Ky.

SUB-ORDER.—ISOSPONDYLI.

(*The Trout-like Fishes.*)

FAMILY CIV.—PERCOPSIDÆ.

(*The Trout Perches.*)

Body covered with moderate-sized ctenoid scales; head naked; no barbels; opercles well developed; gill openings wide; an adipose fin; jaws with villiform teeth; no teeth on vomer or palate; margin of upper jaw formed by intermaxillaries alone; branchiostegals six. A single genus and one or two species inhabiting the fresh waters of the northern U. S. Interesting little fishes, with the general characters of *Salmonidæ*, but having the mouth and scales decidedly Perch-like.

1. **PERCOPSIS,** Agassiz. TROUT PERCHES.

1. ***P. guttatus,*** Ag. Depth $4\frac{1}{2}$ in length; head $3\frac{2}{3}$; silvery, almost pellucid; upper parts with rounded dark spots made up of minute dots; D. 11; A. 7; L. 10; Great Lakes; Ohio R. (*Jordan*); Potomac R. (*Baird*); Delaware R. (*Abbott.*)

FAMILY CV.—SALMONIDÆ.

(*The Trout.*)

Head naked, body scaly, no barbels; margin of upper jaw formed by intermaxillaries mesially and by maxillaries laterally; adipose fin present; belly rounded; air bladder large, simple; pseudobranchiæ present; pyloric appendages usually numerous; eggs falling into the cavity of the abdomen before exclusion. Fresh waters of northern regions, many species periodically descending to the sea; a few permanently marine.

Genera sixteen; species one hundred and sixty. The variations due to age, sex and food are very great, and have led to the establishment of a great number of nominal species in all the leading genera, particularly in *Salmo*.

* Jaws with evident teeth.
  † Dorsal moderate, of less than 20 rays; teeth strong, on jaws, vomer and tongue.
    ‡ Scales small, often imbedded in the skin; lat. l. 100 or more. . . . . Salmo, 1.
    ‡‡ Scales moderate, deciduous, not imbedded; lat. l. 60 to 70. Osmerus, 2.
  †† Dorsal very high of 20 or more rays; teeth small. Thymallus, 3.
** Teeth wanting or reduced to slight roughnesses; scales rather large, loose. . . . . Coregonus, 4.

1. SALMO, Linnæus. Salmons.

☞ For Revision of this group see Addenda, page 355.

* Anadromous species, running up from the sea into fresh water to spawn; the young remaining there for a time, then returning to the sea where they remain except during the season of reproduction; upper jaw in males moderately if at all hooked. (*Salmo.*)

1. ***S. salar,*** L. Great Sea Salmon. No red spots; young (known as *Parr*, or *Smolt*) with dusky cross bars; males in the spawning season with the lower jaw strongly recurved and hooked; body covered with black and red patches; others silvery, with small black dots; eleven or twelve scales in a transverse series from behind the adipose fin obliquely forward to the lateral line; D. 14; A. 11; lat. l. 120. Northern Europe and America, S. to Cape Cod.

2. ***S. quinnat,*** Rich. Columbia River Salmon, known

by the large number of anal rays (16), has been lately introduced into Eastern streams.

** Species not anadromous, living entirely in fresh water or only occasionally passing down to the sea. (Trout.)

† In flowing fresh water, retiring to deeper places in winter; red-spotted.

3. **S. fontinalis,** Mitchill. BROOK TROUT. SPECKLED TROUT. Mouth wide; teeth moderate; body olivaceous, variegated with blackish, with numerous red spots; lower fins usually orange with black and white marginal bands; dorsal with black spots; colors variable; young barred; D. 12; A. 12; lat. l. 200. A well known and beautiful fish, in clear brooks from the French Broad R. to the Arctic regions.

†† In deep rivers or lakes, ascending shallow streams to spawn.

a. Red-spotted.

4. **S. oquassa,** Grd. BLUE-BACK TROUT. OQUASSA. Slender, "the most graceful of all the trouts;" blue or bluish above; sides and below silvery in female, orange in male; sides spotted with orange in both sexes; upper fins bluish, bordered with orange; lower fins fiery orange, margined with white. Oquassa L. and other lakes in Maine.

aa. Black-spotted.

5. **S. sebago,** Grd. SEBAGO LAKE TROUT. UNION RIVER TROUT. Every where black-spotted; scales quite large; D. 14; A. 10; V. 10; lat. l. 115. Sebago L., Union R., and other waters in Maine. (*S. gloveri*, Grd.)

††† Trout living in deep fresh water lakes, coming to the shores to spawn in shallow water; never entering running brooks or passing to the sea.

6. **S. namaycush,** Bloch. MACKINAW TROUT. GREAT LAKE TROUT. Stout; head very large, 3½ in length;

bones of head strong; posterior point of juncture of opercle and sub-opercle much nearer the upper end of the gill opening than to the lower anterior angle of the sub-opercle; teeth strong; fins large, the caudal deeply forked; color grayish, more or less spotted, varying much with circumstances; D. 13 to 14; A. 12; V. 9; lat. l. 220; length 2 to 6 feet. All the Great Lakes, north to the Arctic Sea; a fish of much firmer flesh than the next. (*S. amethystus*, Mitch.)

7. ***S. siscowet,*** Agassiz. SISCOWET. L. SUPERIOR TROUT. Stout; head smaller, 4⅛ in length; posterior point of junction of opercle and sub-opercle nearer to the lower anterior angle of sub-opercle than to the upper end of gill opening; fins and teeth well developed but weaker than in *S. namaycush;* ventrals farther back; caudal less forked; flesh fat and not firm; grayish, with round white spots and markings; D. 12 to 14; A. 12; lat. l. 200. L. Superior, L. Huron.

8. ***S. confinis,*** DeK. LAKE TROUT OF NEW YORK. Blackish, with gray spots; body unusually short and thick. Lakes of Central and Western N. Y.; a doubtful species.

9. ***S. symmetrica,*** Prescott. WINNIPISEOGEE TROUT, Grayish and brown above, marbled with darker; white below; body unusually slender and symmetrical. Lake Winnipiseogee; also a doubtful species.

2. ***OSMERUS,*** Linnæus. SMELTS.

1. ***O. mordax,*** (Mitch.) Gill. COMMON SMELT. Head 4 in length; eye 4 to 4¼ in head; teeth stout, especially large on the tongue; transparent greenish, a silvery band along sides; scales very loose; D. 11; A. 15; lat. l. 66.

Coast, Nova Scotia to Virginia; also "land-locked" in fresh water ponds in Maine, etc. (*O. viridescens*, Mitch)

Var. **spectrum,** (Cope) Jordan. Land-Locked Smelt Head 4½ in length; eye large, 3 in head; depth 8⅓ in length. Wilton Pond, Maine.

Var. **abbottii,** (Cope) Jordan. Abbott's Smelt. Head 4¾ in length; eye 4½ in head; depth 7 in length; colors dark; lat. l. 68. Cobessicontic L., Maine.

3. THYMALLUS, Cuvier. Graylings.

1. **T. tricolor,** Cope. Michigan Grayling. Depth 4⅔ in length; head about the same; purplish gray, silvery below; dorsal with rosy markings and rows of green or blue spots; D. 27; A. 13; lat. l. 97. Waters of the north part of the S. peninsula of Michigan; a beautiful fish.

4. COREGONUS, Linnæus. White Fishes.

§ Lower jaw longest; Ciscoes. (*Argyrosomus*, Agassiz.)

* Body sub-fusiform; depth 4 to 5 in length.

1. **C. artedi,** LeS. Lake Herring. Michigan Herring. Head 4¾ in length (4¼ to 5¼); depth 4 (3⅔ to 4⅓); eye 4 in head; maxillary 3½ to 3¾; mandible 2⅛; scales rather large and loose; bluish above, silvery on sides and below; D. 12; A. 13; lat. l. 76; length 12 to 18 inches. Great Lakes, etc., very abundant; a shallow water species. (*Coregonus albus*, *clupeiformis*, *lucidus*, *harengus*, etc., of authors.)

Var. **sisco,** Jordan. Cisco of Lake Tippecanoe. Head 4½; depth 4⅛; eye 3⅗ in head; maxillary 3⅓; mandible 2⅛; longest dorsal ray three times length of shortest; steel blue above, sides silvery but without the clear luster of *C. hoyi*, finely punctate; D. 11; A. 13; lat. l. 84. Lakes of Indiana and Wisconsin, living in deep water except at the spawning season; very close to the preceding, of which it is probably a variety, but the habits are more like those of the next.

2. **C. nigripinnis**, (Gill) Jor. BLACK FIN. Head $4\frac{1}{2}$ in length; depth the same; eye 4 in head; body compressed; fins blackish, darker than in the others; D. 12; A. 12; lat. l. 80; length 16 to 18 inches; a much larger fish than the preceding. Lake Michigan, in deep water.

** Body elevated; depth about 3 in length.

3. **C. tullibee,** Rich. TULLIBEE. Head $4\frac{1}{4}$ in length; D. 15; A. 15; lat. l. 77. L. Superior and N.

§ Upper jaw projecting beyond the lower; "White Fish." (*Coregonus.*)

4. **C. hoyi,** (Gill) Jor. CISCO OF LAKE MICHIGAN. Head 4 in length; depth $4\frac{1}{2}$; eye large, $3\frac{3}{4}$ in head; maxillary $2\frac{3}{4}$; mandible 2; longest ray of dorsal four times the length of the shortest; upper jaw somewhat projecting, the mouth appearing much as in *Coregonus;* bluish above, sides lustrous silvery, more brilliant than in any other species; D. 11; A. 12; lat. l. 74; length 8 inches. Smallest and handsomest of the Ciscoes, in the deep waters of the Upper Lakes.

5. **C. clupeiformis,** (Mitch.) LAKE WHITE FISH. Depth $3\frac{1}{2}$ in length; head small, $5\frac{1}{4}$; eye 4 in head, about as long as snout; form varying much with age, sex and food; the back generally elevated, and the sides compressed; pale olive above; sides white; D. 13; A. 13; lat. l. 75 to 86. Great Lakes and bodies of water tributary to them, north to the Arctic Sea. (This species seems to be Mitchill's *Salmo clupeiformis*, and the latter specific name will perhaps have to supersede *albus.*) (*C. sapidissimus*, *latior*, *richardsonii*, etc., of authors.)

Var. **otsego,** (DeWitt Clinton.) OTSEGO LAKE WHITE FISH. A form, said to have smaller scales, and dusky lateral stripes, and to be peculiarly excellent for food, found in Otsego Lake, N. Y. (=*C. clupeiformis.*)

Var.? **novangliæ,** (Prescott.) SHAD-WAITER. A slender, short-headed form, found in L. Winnipiseogee, N. H. (=*C. quadrilateralis.*)

Var.? **neohantoniensis,** (Prescott.) WHITING. A little known species or variety found also in Lake Winnipiseogee. (=*C. labradoricus*, Rich.)

6. **C. quadrilateralis,** Rich. MENOMONEE WHITE FISH. Body much more slender, its depth 5 in length; snout compressed, projecting; maxillary very short and small, less than one-fifth the length of head, not reaching to eye; D. 14; A. 13; lat. l. 88. Great Lakes and northward, easily distinguished from the preceding.

7. **C. couesii,** Milner. CHIEF MOUNTAIN WHITE FISH. Form of preceding, but mouth inferior and upper jaw produced in a cutaneous appendage; D. III, 12; A. IV, 10; lat. l. 88. Upper Missouri region and perhaps occurs in Minnesota. A curious species, more unlike the typical *Coregonus* than the species of *Argyrosomus* are. The genus *Argyrosomus* is not a good one and should be reunited to *Coregonus*. Several other species of *Coregonus* have been described from within our limits, but I do not think them valid.

FAMILY CVI.—HYODONTIDÆ.

(*The Moon Eyes.*)

Body much compressed, covered with large, silvery cycloid scales; head naked; margin of upper jaw formed by intermaxillaries mesially and by maxillaries laterally;

no barbels; no adipose fin; lateral line distinct; abdomen not serrated, compressed; moderate sized teeth on jaws, vomer, sphenoid, hyoid, pterygoid and palatine bones; tongue with large teeth; head short, deep; eye very large; gill openings wide; one pyloric appendage; air bladder simple. Three species, inhabiting our Western Streams and the Great Lakes.

1. ***HYODON,*** LeSueur. MOON EYES.

* Belly scarcely carinate; dorsal rays 12. (*Hyodon.*)

1. ***H. tergisus,*** LeSueur. MOON EYE. SILVER BASS. TOOTHED HERRING. Depth $3\frac{1}{8}$ in length; head $4\frac{2}{3}$; snout rounded, shorter than the large eye, which is $3\frac{1}{3}$ in head; scales largest on the flanks; pale olivaceous above, sides brilliantly silvery; D. 3, 12; A. 30; V. 7; lat. l. 59; length 1 foot. Great Lakes and Mississippi Valley, abundant; one of our most beautiful fresh water fishes; variable; it has been described under many names.

2. ***H. selenops,*** Jordan & Bean. SOUTHERN MOON EYE. Body elongate, not greatly compressed; depth 4 in length; belly in front of ventrals transversely rounded (very slightly carinated in *H. tergisus*); head $4\frac{1}{8}$ in length; eye very large, $2\frac{1}{2}$ in head; D. 3, 12; A. 27. Cumberland River and South.

** Belly strongly carinated both before and behind ventrals; dorsal fin, very small, of nine rays; (*Elattonistius*, Gill & Jor.)

3. ***H. chrysopsis,*** Rich. GOLDEN MOON EYE. Body deep, closely compressed; depth $3\frac{1}{4}$ in length; head $4\frac{1}{3}$; eye moderate, $3\frac{1}{2}$ in head; pectorals much shorter than in the other species, nearly as long as head, about reaching ventrals; length of longest dorsal ray half greater than base of fin (about equal to it in the other species); D. 3, 9; A. 31; lat. l. 58. Minnesota and northward.

FAMILY CVII.—CLUPEIDÆ.

(*The Herrings.*)

Body scaly; head naked; abdomen compressed to an edge and sharply serrated; margin of upper jaw formed by intermaxillaries mesially and maxillaries laterally; maxillaries composed of three pieces which are sometimes movable; teeth usually minute or wanting; dorsal moderate; anal often very lông; scales usually large and loose; no lateral line; gills well developed; posterior part of tongue usually provided on each side with a row of conspicuous "gill-rakers;" gill openings wide.

In most seas, many species entering fresh water to spawn, a few remaining permanently. As here restricted, there are about twelve genera, and one hundred and twenty species. Many are highly valued as food fishes. The mouth in *Dorosoma* is so peculiar, that it is probably best to regard that genus as forming a distinct family (*Dorosomatidæ*).

* Upper jaw not projecting beyond the lower. (CLUPEINÆ.)

† Teeth wanting, or on tongue only (rarely a few weak teeth in jaws) no dorsal filament; scales regularly arranged, not ciliated; upper jaw emarginate.

‡ Depth 3⅓ in length; cheeks higher than long; preopercle with a very short horizontal process. . . ALOSA, 1.

‡‡ Depth 3⅗ to 3¾ in length; cheeks longer than high; preopercle with an oblong horizontal process. POMOLOBUS, 2.

** Upper jaw projecting beyond the lower. (DOROSOMINÆ.)

a. Body compressed, deep; last ray of dorsal filamentous; mouth toothless. . . . . . DOROSOMA, 3.

1. ***ALOSA,*** Cuvier. SHADS.

1. ***A. sapidissima,*** (Wilson) Storer. COMMON SHAD. Head 4¼ in length; eye 5 in head; bluish, sides silvery;

scales large; D. 18; A. 21; V. 9; lat. l. 68. Newfoundland to Florida, entering rivers; also lately introduced into Western streams; a valuable food fish. (*A. præstabilis*, DeK.)

2. *POMOLOBUS,* Rafinesque. GASPEREAUS.

1. ***P. pseudoharengus,*** (Wils.) Gill. ALEWIFE. GASPEREAU. SPRING-HERRING. Head 4 in length; eye 4 in head; bluish, sides iridescent; D. 18; A. 18; V, 9. Newfoundland to Florida, entering rivers, sometimes land-locked in ponds; a common food fish. (*A. tyrannus*, DeK. *A. cyanonoton*, Stor., etc., etc.)

Var. ***lacustris,*** Jordan. CAYUGA LAKE SHAD. Head 4 in length; body much heavier forward than in the others; depth of head $4\frac{1}{4}$ in length of body; eye large, longer than snout, 3 in head; scales large, loose; caudal peduncle in its narrowest place not half wider than eye; steel blue, punctate; sides silvery; D. 15; A. 19; lat. l. 45; 33 scutes in all, 13 behind ventrals. Cayuga L., N. Y., dredged in deep water. (Same as preceding.)

2. ***P. chrysochloris,*** Raf. OHIO GOLDEN SHAD. SKIP JACK. Head 4 in length; eye $4\frac{1}{4}$ in head; body elliptical, much compressed; scales large, high, rather firm; depth of head $5\frac{1}{2}$ in length of body; caudal peduncle about twice width of eye; brilliant blue with green and golden reflections, silvery below; D. 18; A. 18; lat. l. 55; 17 scutes behind ventrals. Ohio R. and lower Mississippi; a handsome species. Jaws with distinct teeth.

3. *DOROSOMA,* Rafinesque. GIZZARD SHADS.

= *Chatoessus*, Cuvier.

1. ***D. cepediana,*** (LeS.) Gill. HICKORY SHAD. GIZZARD SHAD. Head 4 in length; depth $2\frac{3}{5}$; origin of

dorsal behind ventrals, nearer snout than caudal; uniform bluish gray; often with a dark shoulder blotch; D. 13; A. 32; lat. l. 55. Cape Cod to Cape Hatteras, chiefly marine, but often land-locked in ponds, where it becomes *D. insociabile*, Abbott.

Var. ***heterura,*** (Raf.) Jor. OHIO GIZZARD SHAD. THREAD SHAD. Head $3\frac{1}{3}$ in length; depth $2\frac{3}{4}$ to 3 in length; dorsal about midway, slightly behind ventrals; dorsal filament nearly one-fourth length of body; bluish, sides bright silvery. Ohio R. and lower Mississippi, apparently not descending to the Sea; also escaped into the Great Lakes. The difference between the curve of the ventral and dorsal outlines is greater in *heterura* than in the Eastern variety.

SUB-ORDER.—EVENTOGNATHI.

(*The Carp-like Fishes.*)

FAMILY CVIII.—CYPRINIDÆ.

(*The Minnows.*)

Head naked, body scaly (except in *Meda*, etc.); margin of upper jaw formed by intermaxillaries alone; mouth toothless; lips much less developed than in the *Catostomoids;* barbels two to four (absent in most of our genera and not large in any); lower pharyngeal bones well developed, falciform, nearly parallel with the gill arches, each provided with one to three series of teeth in small number, rarely more than seven on each side; belly usually rounded, rarely compressed, never serrated; gill openings moderate, separated by a narrow isthmus; no adipose fin; dorsal fin (in all our species) short, with less than ten rays; air bladder usually large, commonly divided into an anterior and a posterior lobe, rarely wanting; stomach without appendages, appearing as a simple enlargement of the intestines.

Small fishes of the fresh waters of the Old World and of North America. Genera about one hundred and fifty, species seven hundred to one thousand; excessively abundant where found, both in individuals and in species, and from their great uniformity in size, form and coloration, constituting one of the most difficult groups in all Natural History in which to distinguish species. Ours are mostly of smaller size than those of the Old World, several of the larger European types being represented in America by *Catostomoid* forms. Our largest species, *Semotilus bullaris*, rarely attains a weight of three or four pounds, and a length of nearly eighteen inches. The smaller *Hybopses* and *Hemitremiæ* scarcely reach a length of two inches.

The spring or breeding dress in many genera is peculiar. Often the top of the head, and sometimes the whole dorsal region also, is covered in the males with rows of spinous tubercles, outgrowths from the epidermis, and usually the skin of the muzzle is then swollen and charged with pigment. In *Semotilus* and *Ceratichthys* these tubercles are quite large and cover the front and sides of the head; in *Pimephales* and *Hyborhynchus* they are placed entirely on the front of the obtuse snout; in *Campostoma* the whole dorsal region, and sometimes the whole body, is rough with large tubercles; in *Luxilus*, *Cliola*, *Lythrurus*, *Telestes*, and *Minnilus*, the prickles are quite small and crowded on the upper surface of the head and neck.

In some genera, the males in spring are adorned with bright tints of red, which give these little fishes a temporary brilliancy scarcely surpassed even by Trouts or Darters. In *Luxilus*, *Lythrurus*, *Campostoma* and

Semotilus, the red appears chiefly as pigment in the membranes of some or all of the fins, the sides of the body being usually more or less flushed; in *Rhinichthys* and *Gila*, the black of a portion of the lateral band usually changes to red; in *Chrosomus*, and *Phoxinus*, the pigment lies mostly in the skin of the belly, and in *Minnilus* it is chiefly about the head and the bases of the fins. In *Pimephales* and *Hyborhynchus*, black pigment is deposited in the skin of the head, and in the species of the sub-genus *Photogenis*, satin-white pigment occurs in the fins. So far as is known to me, species of *Hemitremia*, *Hybognathus*, *Coliscus*, *Phenacobius*, *Exoglossum*, *Ericymba* and some species of other genera show no special variations in the breeding season.

NOTE.—Young *Cyprinidæ* usually are more slender than adults of the same species, and the eye is always much larger; they also frequently show a black lateral stripe and caudal spot which the adults may not possess. Spots on the fins are generally characteristic.

The student will find it necessary from the first to examine very carefully the teeth of these fishes, as the genera, as now accepted, are largely based on dental characters. The pharyngeal bones in the smaller species can be removed by inserting a pin (or better, a small hook) through the gill-opening, under the shoulder-girdle. The teeth should be carefully cleaned with a tooth-brush, or better, a jet of water, and when dry may be examined by any sort of hand magnifying-glass. In most cases a principal row of four or five larger teeth will be found, in front of which is a set of one or two smaller ones. The two sides are usually but not always symmetrical. Thus, "teeth 2, 4—5, 1," indicate two rows of teeth on each side, on the one side, four in the principal row and two in the lesser, on the other side five in the main row and one in the other. "Teeth 4—4" indicates a single row of four on each pharyngeal bone, and so on.

In most of our genera, these teeth—or the principal ones, are "raptatorial," that is, hooked inward at the tips. A "grinding" or "masticatory" surface is an excavated space usually at the base of the hook. Sometime when no masticatory surface is present a lateral bevel of the edge of the tooth much resembles such a surface, and should be carefully examined. In young individuals of many species the edges of the teeth are more or less crenate or serrate. This condition is permanent in the Southwestern genus *Cyprinella* and in *Notemigonus.*

* Native species; fins without serrated spines; dorsal fin short, of less than 10 rays.

† Dentary bones slender, arched and widely separated except at their symphysis; lower jaw not three-lobed.

‡ Air-bladder suspended in the abdominal cavity and surrounded by many convolutions of the long alimentary canal, which is six to nine times the length of the body; (*Campostomatinæ.*)

Teeth in the principal row 4—4, with oblique grinding surface and no hook; mouth inferior; lips sheathed, the upper protractile; sexual differences very great, the males covered with large tubercles in spring.
CAMPOSTOMA, 1.

‡‡ Air-bladder above the alimentary canal and contiguous to the roof of the abdominal cavity.

b. Rudimentary dorsal ray forming a sort of spine separated from first developed ray by a membrane; head short; mouth small, inferior; upper jaw protractile; teeth 4—4, with grinding surface, not strongly hooked; alimentary canal elongate, two or three times length of body; males with very large tubercles on the snout; (fins short; a black spot on front of dorsal about half way up; scales in front of dorsal small.)

c. Lateral line incomplete; body short; head round.
PIMEPHALES, 2.

cc. Lateral line complete; body rather elongate.
HYBORHYNCHUS, 3.

bb. Rudimentary ray at beginning of dorsal, not spine-like, firmly attached to the first developed ray.

d. No barbel at the angle of the mouth.

e. Teeth 4—4, cultriform, without hook, and with oblique grinding surface; alimentary canal elongate, four times the length of body or more; premaxillaries projectile; lips attenuate, without sheath; scales large.

f. Lateral line almost wanting; mouth oblique; dorsal in front of ventrals. . . . Coliscus, 4.

ff. Lateral line complete; mouth horizontal; dorsal over ventrals. . . . Hybognathus, 5.

ee. Teeth raptatorial, more or less strongly hooked; alimentary canal usually short, about as long as body (in *Notemigonus* and *Chrosomus* somewhat elongate.)

g. Lateral line complete (rarely obscure or wanting on the last five or six scales.)

h. Teeth in the principal row 4—4.

i. Teeth with masticatory surface developed.

j. Dorsal fin beginning above some part of base of ventrals; anal basis short, its rays seven to nine.

k. Teeth 4–4; scales normal. Hudsonius, 6.

kk. Teeth 2, 4–4, 2; scales closely imbricated. Luxilus, 7.

jj. Dorsal fin beginning entirely behind ventrals, between ventrals and anal; anal elongate, of ten to twelve rays; (small, elongate species with the mouth oblique, the teeth 2, 4—4, 2, and a black spot at base of dorsal fin in front.) Lythrurus, 8.

ii. Teeth without masticatory surface.

l. Lips thin, normal; opercular and mandibulary bones without externally visible mucous chambers.

m. Dorsal fin beginning entirely behind

ventrals; body elongate, with the mouth oblique, terminal and the head more or less pointed; scales large; anal basis somewhat elongate, the rays usually 10· teeth usually 2, 4—4, 2.
MINNILUS, 9.

mm. Dorsal fin beginning over ventrals; body rather shorter, but similar as to form, form of head, mouth, scales, etc.; anal basis rather short; the rays usually 8.
EPISEMA, 10.

ll. Suborbital, interopercle and base of mandible much dilated, cavernous, crossed by mucous channels, (readily seen under any circumstances by looking at the head of the fish from below); snout thick; mouth small, inferior; teeth 1, 4—4, 0; dorsal over ventrals. . . ERICYMBA, 11.

lll. Lips thick, fleshy, the lower enlarged behind; mouth small, inferior; teeth 4—4; dorsal fin beginning anterior to ventrals; elongate species, resembling young Suckers.
PHENACOBIUS, 12.

hh. Teeth in the principal row 5—5 or 4—5; dorsal entirely behind ventrals.

n. Anal basis not elongate, of nine or fewer rays; teeth entirely without masticatory surface, two-rowed.

o. Mouth normally large and oblique; scales small; (a very large group embracing a very wide variety of forms; the typical Western species are very large, with somewhat the aspect of *Esox*, with large mouth, depressed head, arched back and very slender caudal peduncle; the Eastern species are small, but typically have very large oblique mouths and brilliant coloration in the spring; *no* black spot at the base of the dorsal in front.)
TELESTES, 13.

(*oo. Semotilus corporalis* with a black spot at the base of the dorsal in front, and *S. bullaris* a large species with large scales, have the barbel so minute as to be easily overlooked; they may therefore be looked for here.) SEMOTILUS, 18.

(*ooo. Phoxinus margaritus*, with small scales, a small, horizontal mouth, and short, rounded head, has the lateral line so nearly complete that it may be looked for here.) PHOXINUS, 16.

nn. Anal basis elongate, of 12 to 15 rays; teeth 5—5, with grinding surface and the edges crenate-serrate; belly sub-carinate; body deep, much compressed, with small head, small, oblique mouth, and the lateral line greatly decurved; alimentary canal elongate. NOTEMIGONUS, 14.

gg. Lateral line incomplete or wanting.

p. Dorsal behind ventrals; scales very small; mouth oblique.

q. Teeth 4—5 or 5—5, with grinding surface; alimentary canal elongate. CHROSOMUS, 15.

qq. Teeth 1 or 2, 5—4, 1 or 2, without grinding surface; alimentary canal short; body short and thick. . . . . . PHOXINUS, 16.

pp. Dorsal over ventrals; scales large; teeth 4—5, (rarely 4—4) with grinding surface; alimentary canal short. . . . HEMITREMIA, 17.

dd. Maxillary provided with a small—often very minute—barbel; alimentary canal short; teeth hooked.

r. Premaxillaries projectile, the skin of the lip separated by a groove from that of the forehead.

s. Teeth two-rowed, the principal row 4—5, without grinding surface; barbels minute, just above the angle of the mouth; size large, dorsal fin inserted more or less backwards. SEMOTILUS, 18.

ss. Teeth in the principal row 4—4; the barbel at the extremity of the maxillary.

t. Teeth with developed grinding surface; dorsal fin directly over ventrals; scales large; head broad, much depressed, nearly flat above, resembling the head of a *Cyprinodont.* PLATYGOBIO, 19.

tt. Teeth without grinding surface; dorsal fin beginning over, slightly before or slightly behind ventrals; head not flattened. CERATICHTHYS, 20.

rr. Premaxillaries not projectile, the skin of the lip continuous with that of the forehead; teeth 2, 4—4, 2, without grinding surface; dorsal behind ventrals; barbel terminal; scales very small; mouth more or less inferior. . . . . RHINICHTHYS, 21.

†† Dentary bones straight and flat, united throughout their length; mandible much incurved, tongue-like, a lobe on each side of it at base; air bladder normal; bones of head not cavernous; intermaxillaries not projectile. (*Exoglossinæ.*)

u. Teeth 1, 4—4, 1, hooked, without grinding surface; dorsal slightly behind ventrals; no barbels. EXOGLOSSUM, 22.

** Species introduced from the Old World; dorsal very long and anal short, each preceded by a stout spine which is serrated behind.

v. Mouth without barbels teeth compressed, 4—4. (*Carassiinæ.*) CARASSIUS, 23.

vv. Mouth with four long barbels; teeth molar 1, 3—3, 1, (*Cyprininæ.*) . . . . CYPRINUS, 24.

1. *CAMPOSTOMA,* Agassiz. STONE LUGGERS.

1. ***C. anomala,*** (Raf.) Ag. STONE LUGGER. STONE ROLLER. Brownish, with a brassy luster above, the scales more or less mottled with dark; a black vertical bar behind opercle; iris usually orange-red; dorsal and anal each with a dusky cross-bar about half way up, the

rest of the fin olivaceous, or in spring males fiery orange; males in spring with many rounded tubercles on head, and usually the whole upper surface—in no other genus are these nuptial appendages so extensively developed—scales deep, rather small and crowded anteriorly; intestinal canal six to nine times the total length of the body, its numerous convolutions passing above and *around* the air-bladder, an arrangement found in *Campostoma* alone among all the Vertebrates; D. I, 8; A. I, 7; lat. l. 50 to 55; L. 4 to 8; herbivorous. Mississippi Valley, every where abundant; one of the most curious and interesting of American fishes. [*C. dubium*, (Kirt.) Cope. *C. callipteryx*, *gobioninum*, etc., Cope.]

2. *PIMEPHALES,* Rafinesque. ROUND-HEADED MINNOWS.

1. ***P. promelas,*** Raf. FAT-HEAD. BLACK HEAD. Head almost globular, black in adult males; snout in ♂ with several large tubercles; body very short and deep; scales crowded; eye small; mouth very small and short; a large black dorsal blotch; males dusky; females olivaceous; D. I, 7; A. I, 7; lat. l. 46; L. 2½. Ohio Valley to Upper Missouri. Known at sight, as it resembles nothing else.

3. *HYBORHYNCHUS,* Agassiz. BLUNT-NOSED MINNOWS.

1. ***H. notatus,*** (Raf.) Ag. BLUNT-NOSED MINNOW. Brownish or bluish, a dusky shade along sides, sometimes forming a caudal spot; a distinct black spot on middle of front rays of dorsal; head short; snout in spring males with disproportionately large tubercles, usually fourteen in all; no distinct barbel at each angle of the mouth; scales in front of dorsal small and crowded; D. I, 8; A. I. 7; lat. l. 45; L. 3 to 4. N. Y. to Tenn., Wis., and Mo.; very abundant in the Ohio Valley.

2. ***H. superciliosus,*** Cope. Head broader; a distinct barbel at each angle of the mouth; scales on sides high and narrow. With the preceding, of which it is perhaps a variety.

4. ***COLISCUS,*** Cope. Coliscus.

1. ***C. parietalis,*** Cope. Silvery; D. I, 7; A. I, 8; lat. l. 42. Missouri.

5. ***HYBOGNATHUS,*** Agassiz. Blunt-Jawed Minnows.

1. ***H. nuchalis,*** Ag. Blunt-Jawed Minnow. Suborbital bones broad and short, not long and narrow as in the next; head 4⅔ in length; eye small, shorter than snout, 4 to 4½ in head; depth 4½ in length, about equal to length of head; D. I, 8; A. I, 8; lat. l. 38; L. 2½. Ohio Valley and W. This and the next may be readily known from the *Hybopses*, which they strongly resemble externally, by the peculiarities of the intestines.

2. ***H. argyritis,*** Grd. Silvery Minnow. Olivaceous green above, sides clear silvery with bright reflections; fins unspotted; eye large, longer than muzzle, 3 to 4 in head; depth 4⅛ in length; scales in front of dorsal quite large; lateral line decurved; head large, upper jaw heavy; D. I, 8; A. I, 8; lat. l. 38; L. 5. N. J. to S. C. and W. to the Upper Missouri; abundant in the larger streams; one of our handsomest dace. (*H. osmerinus*, Cope, not in the least different.)

3. ***H. regius,*** Grd. Royal Minnow. Head 5 in length; mouth small; bright silvery; D. I, 9; A. I, 9; L. 7; lat. l. 38. Maryland and Virginia; a species similar to the preceding but apparently much larger; the two need further comparison.

6. HUDSONIUS,* Girard. MINNOWS.

* Mouth inferior, horizontal, small (rarely oblique, and the teeth 4—4); dorsal over or in front of ventrals.

† Teeth two-rowed; body elongate, silvery, the head contained 5¼ to 6 times in total length, including caudal fin; dorsal fin beginning in front of ventrals; grinding surface of teeth often more or less distorted or even obliterated. (*Hudsonius*, Grd.)

1. ***H. storerianus,*** (Kirt.) Grd. STORER'S MINNOW. Silvery, scales with black dots, forming a dark lateral stripe; snout blunt, about as long as eye; depth 5 in length; D. I, 8; A. I, 7; lat. l. 41. Great Lake region, etc.

2. ***H. fluviatilis,*** Grd. SPAWN-EATER. Silvery, often with dark shades; snout much shorter than eye, bluntly rounded; depth 4 in length; D. I, 8; A. I, 8; lat. l. 38; teeth usually 2, 4—4, 2. Lakes and rivers; abundant eastward. (*Huds. fluviatilis*, Grd.)

3. ***H. amarus,*** (Grd.) "SMELT." Very similar, but paler and with the snout much less decurved, less blunt than the two preceding species; D. I, 7; A. I, 8; lat. l. 38; teeth usually 1, 4—4, 1. Penn. to Ga. (*H. phaënna*, Cope.)

†† Teeth 4—4; body shorter, small; head larger, 4½ to 5 in length, with caudal fin; dorsal fin beginning over ventrals; small species, usually without bright colors.

‡ Mouth inferior or horizontal, small.

a. Lateral line 43 to 45; a spot on dorsal fin in front.

4. ***H. tuditanus,*** Cope. Form, coloration and dentition of *Hyborhynchus notatus*, but with the alimentary canal

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* The name *Hybopsis*, usually applied to this genus, was apparently based on a species of *Ceratichthys*. *Alburnops* also sometimes used, on species of *Luxilus*.

short, and the dorsal spine not distinct; olivaceous; scales black edged; 27 scales in front of dorsal fin. Indiana; a species unknown to me.

aa. Lateral line 36 to 37.

5. ***H. spectrunculus,*** Cope. Eye large; head broad and flat; a plumbeous lateral band and black caudal spot; fins reddish; A. I, 9. Tennessee River.

6. ***H. stramineus,*** Cope. STRAW-COLORED MINNOW. Mouth small; snout very obtuse; body rather stout; coloration pale; 12 to 15 large scales in front of dorsal; a small, pale, insignificant species. Common in our Western streams.

aaa. Lateral line 31 to 33.

7. ***H. procne,*** Cope. Scales large; caudal peduncle contracted and slender; dorsal region compressed and elevated; muzzle very obtuse; a plumbeous lateral band over black pigment; D. I, 8; A. I, 7. Pennsylvania N. J., etc., common; one of the smallest species.

8. ***H. missuriensis,*** Cope. Form stout, with large head and thick caudal peduncle; twelve scales before dorsal; colors rather pale; D. I, 8. Missouri, etc.

9. ***H. microstomus,*** (Raf.) Jordan. LONG-HEADED MINNOW. Head elongated; a silvery band along sides and a series of black dots along lateral line; depth 5 in length; caudal peduncle not abruptly contracted; pectorals long, nearly reaching ventrals; D. I, 8; A. I, 7; lat. l. 33. Va. to Ky. (*H. longiceps, Cope.*)

10. ***H. volucellus***, Cope. LONG-FINNED MINNOW. Head flattened, elongate, $3\frac{3}{4}$ in length; pectoral fins unusually long, reaching to ventrals; caudal peduncle slender; olivaceous, a dusky lateral band. Michigan and Wisconsin.

‡‡ Mouth larger, oblique; the jaws about equal.

b. Lateral line 35.

11. ***H. fretensis,*** Cope. Body compressed and elongate, as in the genus *Notropis;* lateral line decurved; seventeen rows of scales in front of the dorsal; a broad plumbeous shade on sides. Mich. to Ill.

bb. Lateral line 44.

12. ***H. hœmaturus,*** Cope. Red-Tailed Minnow. Lateral line nearly straight; colors dull; sides not silvery; a dusky spot at base of caudal; caudal fin dull, brick-red; anal short, I, 7. Tributaries of Lake Michigan.

** Teeth 1, 4—4, 1; dorsal fin inserted just behind ventrals; fins and lower parts with milk-white pigment in spring, never red; dorsal with a large black spot on the last rays, about half-way up (an important feature). (*Photogenis*, Cope.)

13. ***H. galacturus,*** (Cope) Jor. Milky-Tailed Shiner. Bluish above, sides bright silvery, with bright reflections; base of caudal fin largely yellowish, or cream-color; teeth rarely serrate; head $4\frac{1}{3}$ in length; depth $4\frac{3}{4}$; mouth large, nearly horizontal; body slender, more elongated and less compressed than in the next; scales smooth and firm, usually with dusky edges; D. I, 8; A. I, 8; lat. l. 40; L. 5. Cumberland River and S., abundant. Resembles the next, but larger, and with a larger mouth.

14. ***H. analostanus,*** (Girard) Jor. Silver Fin. Leaden silvery; fins satin white in the breeding season; dorsal with a conspicuous black spot, as in the preceding; head 4 in length, rather short and deep; mouth rather small, very oblique, yet the lower jaw received within the upper in the closed mouth; body much compressed; depth $3\frac{3}{4}$ in length; D. I, 8; A. I, 8; lat. l. 35 to 40; L. $3\frac{1}{2}$. Teeth usually more or less serrate. Cayuga L., N. Y. (*S. H. Gage*), to N. J., Va., and Ind., abundant. In full breeding dress one of the most exquisite of all our fishes. *L. kentuckiensis*, Kirt., not of Raf.

7. ***LUXILUS,*** Rafinesque. SHINERS.

(=*Hypsilepis*, Baird.)
(=*Plargyrus*, Girard.)

*Teeth 2, 4—4, 2; fins with red pigment, but no white. (*Luxilus.*)
† Dorsal over ventrals; body deep, with very high scales.

1. ***L. cornutus,*** (Mitch.) Jordan. COMMON SHINER. RED-FINNED SHINER. ROUGH-HEAD. RED-FIN. Adult deep steel blue or olivaceous above, with golden vertebral and lateral bands, very conspicuous in life; sides silvery, rosy in males in spring; fins plain olivaceous or somewhat dusky, becoming crimson in spring; young olivaceous and silvery, not closely resembling the adult; depth 3 to 5 in length, greater than length of head in adults; head large; mouth moderately oblique, the lower jaw not projecting; lateral line much decurved; D. I, 8; A. I, 9; lat. l. 40 to 45; L. 6. U. S. from Maine to the Rocky Mountains, everywhere abundant, and extremely variable. The adults may be known at once by the high and narrow exposed surfaces of the scales; the young often need close attention. (*Plargyrus typicus*, Grd.; *L. chrysocephalus*, Raf.; *L. diplemius* and *plargyrus*, Kirt.; *Leuciscus frontalis*, Ag., a stout variety from the Great Lakes.)

2. ***L. selene,*** Jor. SILVER SHINER. Smaller and much more elongate, depth 4½ in length; head short and stout, about the same; eye 3 in head, very large; lateral line little decurved; scales large, much less narrowed than in *L. cornutus;* dorsal high; D. I, 8; A. I, 7; lat. l. 40; bluish above; sides silvery. Lake Superior.

† Dorsal distinctly behind ventrals; body elongate; lower jaw longest.

3. ***L. coccogenis,*** (Cope) Jordan. RED-CHEEKED SHINER. Steel blue, sides silvery; dorsal, caudal, and pectorals red in the male; adults of both sexes with the upper jaw, base of dorsal and a vertical streak down the cheeks, bright orange red, the latter mark appearing like a brand; dorsal and caudal with a broad dusky bar; slimmer than *cornutus;* depth $4\frac{1}{3}$ in length, about equal to length of head; mouth very oblique, the lower jaw projecting (excepting in tuberculate males); D. I, 8; A. I, 9; lat. l. 42. Tributaries of the Tennessee R., abundant; a beautiful and very distinct species.

††† Dorsal behind ventrals; mouth small; scales little imbricated.

4. ***L. lacertosus,*** Cope. A large dull-colored species with broad, deep head, 4 in length, and large scales; mouth wide; eye large; silvery, dusky above. Tennessee River.

5. ***L. plumbeolus,*** Cope. Body compressed, elongate; lower jaw projecting; color uniform silvery; A. I, 9; lat. l. 39; teeth 2, 4. Great Lakes.

6. ***L. chalybœus,*** Cope. PIGMY MINNOW. Muzzle flat; head 4 in length; caudal peduncle abruptly slender, lateral band very distinct, shining black; A. I, 8; lat. l. 36. Penn., N. J.; one of the smallest of the *Cyprinidæ;* length $1\frac{1}{2}$ inches; (resembles *Hemitremia bifrenata.*) The males in the spring are brilliantly colored. the lower parts being largely orange.

7. ***L. rubricroceus,*** Cope. CRIMSON FALL FISH. A small, rather deep-bodied species having somewhat the

form of a Minnilus; lower jaw rather longest; 19 rows of scales in front of the dorsal; lat. l. 38; coloration most brilliant; clear greenish and silvery; males brownish orange above; lateral band, chin and snout largely vermilion; sides red or yellowish. Tennessee and Savannah Rivers. Abundant in the clear mountain streams and below waterfalls. Several other similar brilliantly colored species occur farther south.

8. ***LYTHRURUS,*** Jordan. RED-FINS.

1. ***L. cyanocephalus,*** Copeland. BLUE-HEADED RED-FIN. HOY'S RED FISH. Body short, stout and deep, the depth 4 in length; the axis of the body being half nearer the ventral than the dorsal outline; head very short and deep, $4\frac{1}{8}$ in length; mouth large, very oblique; D. I, 8; A. I, 12; lat. l. 46. Head bright glaucous blue in males in spring; sides and fins chiefly crimson, the black dorsal spot conspicuous; teeth 2, 4—4, 2. Southern Wisconsin; near the next but much more chubby, with somewhat the aspect of *Pimephales.*

2. ***L. diplæmius,*** (Raf.) Jordan. RED-FIN. Bright steel blue, with purplish shades, silvery below; a large black spot on the anterior rays of dorsal in front; fins otherwise unicolor, plain olivaceous in ♀, brilliant brick red in spring males; scales with more or less dark edging; nuptial tubercles minute, very numerous, whitish, chiefly on the upper surface of head; body much compressed; back elevated; head deep, rather obtuse; depth $3\frac{3}{4}$ in length; D. I, 9; A. I, 10; lat. l. 44; L. 3. Western streams, generally abundant; an exceedingly brilliant fish in the breeding season; known at all times by the dorsal spot and compressed body, with large fins and

long caudal peduncle. (*Rutilus ruber*, Raf.) (Not *Leuciscus diplemius*, Kirt.)

3. ***L. ardens,*** (Cope) Jordan. Southern Red-Fin. Colors similar, but red on sides more conspicuous; head rather pointed, with the mouth still more oblique; depth 5 in length; D. I, 9; A. I, 11; lat. l. 50. Cumberland and Roanoke Rivers. (Aspect more of *Notropis.*)

9. *MINNILUS,* Rafinesque. Rosy-Faced Minnows.

(=*Minnilus*, Raf.; *Alburnellus*, Girard.)

1. ***M. rubrifrons,*** (Cope) Jordan. Rosy-Faced Minnow. Olive above, with a clear green lustre; sides silvery; a dark vertebral line; forehead, opercular region, base of dorsal, etc., flushed with red in spring; upper surface of head minutely tuberculate in males at that season; head rather pointed, about $3\frac{4}{5}$ in length; depth $4\frac{1}{2}$; eye about 4 in head; D. I, 8; A. I, 10; lat. l. 38; L. 3 or less. Ohio Valley, abundant; an elegant little fish, well distinguished from *N. rubellus* by the smaller size, deeper body and much longer head, as well as by peculiarities of form.

2. ***M. dilectus,*** (Grd.) Jordan. Delectable Minnow. Intermediate between the preceding and the next; smaller than *rubellus* and more thick-set; head=depth, about 5 in length; eye longer than snout, 3 in head; coloration of the others; D. I, 8; A. I, 11; lat. l. 42; L. $3\frac{1}{2}$. Ohio R., (New Albany, Dr. *Sloan*) to Arkansas R. and S. (Type of *Alburnellus.*)

3. ***M. rubellus,*** (Ag.) Jordan. Rosy Minnow. Light olive, with brilliant clear green lustre; a dark vertebral line, and dark edges to the dorsal scales; sides brilliantly silvery, the lustre overlying a plumbeous lateral shade;

forehead, etc., rosy in spring; sides sometimes rosy tinted; golden dorsal and lateral stripes, conspicuous in life as in most silvery species; head short, somewhat pointed, 5 in length; depth $5\frac{1}{3}$ to $5\frac{1}{2}$; eye 4 in head; D. I, 8; A. I, 10; lat. l. 38; L. 4 to 5. Great Lakes and Ohio Valley; abundant in the larger streams; even more graceful in form and delicate in coloration than the preceding.

4. **M. dinemus,** (Raf.) Jor. EMERALD MINNOW. Coloration exactly as in *M. rubellus*, but the body very slender and less compressed, more elongated than in any other of our *Cyprinidæ*, the depth being only from one-sixth to one-seventh of the length; head $4\frac{3}{4}$ in length; eye $3\frac{1}{8}$ in head; fins as in preceding; L. 4 to 5. L. Michigan and Ohio Valley, in the larger streams, like the others, "going in flocks." (*A. jaculus* and *A. arge*, Cope.) (This is Rafinesque's "Emerald Minnow," the type of his genus *Minnilus*. This species and the two preceding are not very well separated.)

5. **M. micropteryx,** (Cope) Jordan. SMALL-FINNED MINNOW. Resembles *M. rubrifrons*, but the fins all very low, the ventrals scarcely reaching to the line of the middle of dorsal; head $4\frac{1}{2}$ in length; depth $5\frac{1}{2}$ to $5\frac{3}{4}$; lat. l. 39; L. 3. Tennessee and Cumberland Rivers.

6. **M. photogenis,** (Cope) Jor. WHITE-EYED SHINER. An extremely variable species, differing from all of the preceding in the less posterior position of the dorsal, and in the rather more compressed form; depth $4\frac{1}{2}$ to 7 in length; head 4 to $4\frac{1}{2}$ in length; eye $3\frac{1}{3}$ in head, large and white; olive green; no red pigment; sides silvery; male minutely tuberculate about the head in spring; dorsal fin beginning much nearer caudal than end of

muzzle; D. I, 8; A. I, 10; lat. l. 40. Streams of the Allegheny region from Penn. S. (*Photogenis leucops*, Cope.)

7. ***M. telescopus,*** Cope. Similar, but more slender (usually), and the mouth more oblique; dorsal still less posterior, midway between snout and origin of caudal; sea green; dorsal scales dark-edged; sides silvery; eye larger, 2¾ in head; D. I, 8; A. I, 10; lat. l. 38. Tennessee River; perhaps a variety of the preceding.

8. ***M. lirus,*** Jordan. STEEL-SIDED MINNOW. Smaller than any of the preceding, and very slender; the depth 4¾ in length; the head small, 4⅓; scales very small, and very thin, so that young specimens appear naked; the scales in front of dorsal, 25 in number, especially small; fins small; dorsal far back; head in spring males strongly tuberculate, and the fins red; color, very pale transparent green; sides with a very distinct metallic steel-blue band; D. I, 8; A. I, 10; lat. l. 45; L. 2½. Tennessee and Alabama Rivers; a strongly marked species, related to the genus *Lythrurus*, but the teeth are sharp-edged.

10. EPISEMA, Cope & Jor. WHITE-CHEEKED SHINERS. (*Photogenis*, Cope—in part; *Episema*, Cope & Jordan.)

1. ***E. ariomma,*** (Cope) Jor. BIG-EYED SHINER. General appearance of *N. rubellus*, but larger, reaching a length of nearly 5 inches; eye very large, 2½ in head, relatively larger than in any other of our Minnows; head large; bluish above, sides bright silvery; D. I, 8; A. I, 9; lat. l. 40. White R., Indiana, abundant, but not yet recognized elsewhere.

2. ***E. scabriceps,*** (Cope) Jor. ROUGH-HEADED SHINER. Head broad, prickly in spring; eye large, 3 in head;

head flattish above; mouth little oblique; greenish, sides leaden silvery; D. I, 8; A. I, 8; lat. l. 38. Ohio Valley.

3. ***E. leucioda,*** (Cope) Jor. Head $4\frac{1}{2}$ in length; eye moderate, $3\frac{1}{2}$ in head; olive, scales above dark-edged; sides silvery with a purple band; muzzle and base of dorsal red in males; a black spot at base of caudal fin; D. I, 8; A. I, 8; lat. l. 39. Tennessee River.

11. ERICYMBA, Cope. ERICYMBAS.

1. ***E. buccata,*** Cope. SILVER-MOUTHED DACE. Elongate; depth nearly 5 in length; head 4; eye large, 3 in head; olivaceous above, sides brilliantly silvery, a narrow vertebral line, and a lateral chain of brown dots; upper jaw rather large, its profile angulated; mucous channels in lower jaw very conspicuous; D. I, 8; A. I, 8; lat. l. 33; L. 5. Ohio Valley, Penn. to Kentucky. and Illinois, abundant. A beautiful little fish singularly distinguished from all our other species by the cavernous bones of the head.

12. PHENACOBIUS, Cope. PHENACOBIES.
(=*Sarcidium*, Cope.)

1. ***P. uranops,*** Cope. Head $4\frac{3}{4}$ in length; body very long and slender, nearly cylindric; isthmus very wide; chest naked; eyes large, high up, $3\frac{1}{2}$ in head; depth $6\frac{1}{4}$; lips very thick, tuberculate; pale, a darker lateral streak; D. I, 8; A. I, 7; lat. l. 60. Tennessee R.

2. ***P. teretulus,*** Cope. Head=depth, $4\frac{3}{4}$ in length; form stouter than in the preceding; chest scaled; lips plicate; a dusky lateral band; D. I, 8; A. I, 7; lat. l. 43. Streams of W. Va.

3. ***P. scopiferus,*** (Cope) Jor. Form comparatively stout; depth 4 in length; head not large, $4\frac{3}{4}$ in length;

lower lip developed only on the sides of the jaw as a conspicuous lobe; thorax naked; D. I, 8; A. I, 7; lat. l. 44. Missouri to Illinois. (*P. teretulus*, var. *liosternus*, Nelson.)

13. TELESTES, Bonaparte. LONG-JAWED SHINERS.

* Scales very small; mouth large, very oblique, the lower jaw projecting and considerably compressed; form elongate; size small. (*Clinostomus*, Grd.)

1. ***T. elongata,*** (Kirt.) Jordan. RED-SIDED MINNOW. Dark bluish, mottled by paler scales; sides with a broad black band, the front half of which is bright crimson in the spring; a dark dorsal stripe; mouth very large, the lower jaw narrowed and projecting farther than in any other of our Dace; a little knob at the tip which overlaps the end of the upper jaw; body much elongated, but little compressed; depth 5 in length; head 4¼; eye moderate, about 3½ in head; D. I, 8; A. I, 8; lat. l. 70 to 75; L. 4. Great Lakes, Ohio Valley, etc.; a handsome species.

2. ***T. proriger,*** Cope. LONG-JAWED SHINER. Rather more compressed than the preceding; and paler in color with larger scales; lat. l. 60 to 65; otherwise very similar, perhaps a variety; D. I, 8; A. I, 7. Ohio Valley.

3. ***T. estor,*** Jordan & Brayton. PIKE SHINER. Body quite deep and compressed; depth 4¼ in length; head very long and large, 3⅓ in length; mouth very large and oblique, even larger than in *T. elongata;* lateral line strongly decurved; scales moderate, much larger than in the preceding; lat. l. 50; D. I, 8; A. I, 8; teeth 2, 4—5, 2; color bluish olive; sides silvery, bright crimson in males; no dark lateral band. Cumberland and Tennessee Rivers.

4. ***T. funduloides,*** (Grd.) Cope. ROSY DACE. A light and a dark lateral band; snout pointed; mandible shorter than in the preceding, less compressed; eye larger, 3 in head; depth 5 in length; head 4¼; D. I, 9; A. I, 8; lat. l. 48. Streams about Chesapeake Bay and S.

5. ***T. vandoisula,*** (Val.) Jor. Body deeper, depth = length of head, 3⅔ in body; eye rather small, 3½ in head; no dark lateral band; sides rosy, fins orange; D. I, 9; A. I, 8; lat. l. 53. Virginia to South Carolina. (*C. affinis*, Grd. *C. carolinus*, Grd.)

14. NOTEMIGONUS, Rafinesque. GOLDEN SHINERS.
= *Stilbe*, DeKay (preoccupied in Botany.)
= *Stilbius*, Gill (substitute for Stilbe.)
= *Luxilus*, Girard (not of Raf.)
= *Leucosomus*, Storer (not of Heckel.)
= *Plargyrus*, Putnam (not of Raf.)
< *Abramis*, Cuvier (a closely related European genus.)

1. ***N. chrysoleucus,*** (Mitch.) Jordan. SHINER. STILBE. BREAM. Body much compressed; abdomen trenchant; head small, about 4 in length; depth 3 (2½ to 4); lateral line much decurved; scales small on the back, much larger below; dark steel blue or green above, sides silvery or golden, every where with brilliant reflections, green, yellow, and red; young specimens paler, looking like young *Luxili*, but the adults are among the largest in the family and bear a strong resemblance to Shad, a circumstance which has misled many observers, and among them Rafinesque; D. I, 7; A. I, 14; lat. l. 45 to 50. New England to Minnesota and S.; abundant in bayous, ponds, and weedy streams; this species is much more tenacious of life than is any other of our *Cyprinoids.* [*N. auratus*, Raf. *S. chrysoleuca*, (Mitch.) DeK. *A. versicolor*, DeK.]

2. ***N. americanus***, (L.) Jor. SOUTHERN BREAM. Body rather more elongate, still more strongly compressed; head flattish above; eyes very large, 3 in head (instead of 4); anal fin much larger than in *N. chrysoleucus;* D. I, 8; A. I, 16; lat. l. 43; coloration pale; males with the lower fins scarlet. Virginia to Georgia. (*N. ischanus*, Jor.)

15. CHROSOMUS, Rafinesque. RED-BELLIED MINNOWS.

1. ***C. erythrogaster,*** Raf. CHROSOMUS. RED-BELLIED DACE. Brownish olive, with black spots on the back, a black or brown band from above the eye, straight to the tail; another below, running through eye, decurved along the lateral line; belly and space between bands bright silvery, brilliant scarlet red in spring males, as are the bases of the vertical fins; a dark vertebral line; females obscurely marked; D. I, 8; A. I, 9; lat. l. 80 to 90. Penn. to Wis. and Tenn., abundant in small streams; one of the most beautiful of our fishes; in high coloration the fins are bright yellow, and the body is minutely tuberculate. There seems to be but one well-defined species. It is the most desirable of all our minnows for aquarium purposes, being hardy, graceful, and brilliantly colored.

16. PHOXINUS, Rafinesque (1820 !). EUROPEAN MINNOWS.

* Lateral line very short.

1. ***P. neogæus,*** Cope. NEW WORLD MINNOW. Blackish above, a broad black lateral band through eye, becoming a spot on the tail; belly white; fins dusky; head large, 3½ in length; depth rather less; mouth large, oblique; eye large; D. I, 7; A. I, 7; L. 3; lat. l. 77. Southern Mich. (*Cope*); Baraboo R., Wis. (*Bundy*); a

curious fish, related to the Minnow of Europe (*P. lævis*, Ag.)

2. **P. flammeus,** Jordan & Gilbert. FLAMING MINNOW. Black above, silvery below; a black lateral band; belly flame color in spring males; body stout, depth 4 in length; head about the same; mouth small, oblique, the lower jaw projecting; *scales much larger* than in *P. neogæus;* lat. l. 43; D. I, 8; A. L, 8; tubes of lateral line developed only on 14 scales. Elk River, Tennessee.

** Lateral line almost complete.

3. **P. margaritus,** (Cope) Jor. PEARLY DACE. Head =depth 4 in body; scales small, much crowded forwards; lateral line hardly complete, the tubes wanting on the last 3 to 8 scales; head blunt, short and rounded; mouth quite small, oblique, the upper jaw the longer, the lower jaw not compressed; color light olive; sides dusky; belly in summer bright crimson; D. I, 8; A. I, 8; lat. l. 58. Teeth 2 5—4, 2; a stout-bodied species.

17. ***HEMITREMIA,*** Cope. HEMITREMES.

* Teeth 4—5.

1. **H. vittata,** Cope. SOUTHERN HEMITREMIA. Dusky; a black lateral band, and above this several paler and smaller ones, the upper running into the dorsal line; fins small; depth 4 in length; head 4½; D. I, 8; A. I, 7; lat. l. 34; L. 2. Head waters of Tennessee and Cumberland Rivers. (Description from Kentucky specimens.)

** Teeth 4—4. (Genus *Chriope*, Jor.)

2. **H. heterodon,** Cope. NORTHERN HEMITREMIA. Head = depth, about 4 in length; snout flat, rather pointed; back compressed, elevated; olive, a dusky lateral shade; D. I, 8; A. I, 8; lat. l. 35. Mich., Wis.

3. **H. bifrenata,** Cope. EASTERN HEMITREMIA. Head

=depth, 4⅕ in length; snout blunt; olive, a burnished, jet-black lateral band of a deeper color than in any other small minnow; D. I, 8; A. I, 7; lat. l. 36. Mass. to Md., abundant.

18. SEMOTILUS, Rafinesque. CHUBS.

* Dorsal fin well behind ventrals, with a black spot at base; scales small, crowded forwards, 45 to 70 in the lateral line. (*Semotilus.*)

1. ***S. corporalis,*** (Mitch.) Putnam. COMMON CHUB. HORNED DACE. Body stout, depth 4½ in length; head large, 3¾; dusky above, especially along edges of scales; sides bluish, a black lateral band in young; silvery below, sides and fins flushed with crimson in spring; D. I, 8; A. I, 8; lat. l. 55 to 65; L. 10 to 12. New England (Housatonic R., *Jordan*) to the Missouri region and S.; the most widely diffused of our *Cyprinidæ*, excepting *Nocomis biguttatus.* It may be known under all circumstances by the large head and the peculiar dorsal spot. (*S. atromaculatus dorsalis*, *cephalus*, *speciosus*, etc., etc., of authors.)

** Dorsal very slightly behind ventrals, without black spot at base in front; scales large, about 50 in lateral line, not much crowded forwards. (*Leucosomus*, Heckel.)

2. ***S. bullaris,*** (Raf.) Jor. FALL FISH. DACE. ROACH. Brownish above, with blue reflections; sides silvery, rosy in spring; depth 4½ in length; head 4; D. I, 8; A. I, 8; lat. l. 46 to 50; largest of our Eastern *Cyprinidæ*, reaching a length of 18 inches. New England to Virginia, generally abundant in the rapids of the larger streams. (*Semotilus rhotheus*, *argenteus* and *pulchellus*, Auct.; *Leucosomus cataractus*, Baird.)

20. PLATYGOBIO, Gill. FLAT-HEADED CHUBS.

1. ***P. gracilis,*** (Rich.) Gill & Jordan. Body long and

slender; mouth large, the upper jaw longest; barbel well developed; fins large; head small and much flattened above; scales large, olivaceous; sides silvery. D. I, 7; A. I, 7; lat. l. 50. Minnesota north and west, abundant; a large species of a singular form. (*Pogonichthys communis*, B. & G.)

20. CERATICHTHYS, Baird. HORNY HEADS.

(*Nocomis*, Girard.)

* Mouth terminal, large; teeth 4—4 (sometimes 1, 4—4, 1); size large; dorsal over ventrals.

1. **C. biguttatus,** (Kirt.) Girard. HORNED CHUB. JERKER. Bluish olive, sides with bright green and coppery reflections; a curved blotch behind the opercle; fins pale orange, unspotted; white below, rosy in spring; adult males in the spring with the top of the head very much swollen, elevated into a sort of crest, sometimes nearly one-third of an inch higher than the level of the neck, covered with large tubercles; a stout species, with large scales which are not crowded anteriorly; young with a dark caudal spot; head 4 in length; depth nearly the same; D. I, 8; A. I, 7; lat. l. 40 to 45; L. 6 to 9. Penn. to Utah and S.; abundant almost every where; the most widely diffused of all our fresh water fishes. [*C. biguttatus*, (Kirt.) Bd., *C. stigmaticus*, *cyclotis*, etc., Cope.] Breeding males sometimes have a red spot on each side of head, hence the specific name.

2. **C. micropogon,** Cope. Head short, almost exactly as in *Luxilus cornutus;* barbel small; caudal peduncle slender; teeth 4—4; lat. l. 40. Conestoga R.; but one specimen known—perhaps a hybrid.

** Mouth sub-inferior, rather small, the upper jaw the longer; size not large; teeth 4—4, or 1, 4—4, 1.

† Dorsal fin in advance of ventrals.

a. Lateral line 36 to 40; head short; lips little developed; teeth 1, 4—4, 1.

3. ***C. amblops,*** (Raf.) Cope & Jordan. BIG-EYED CHUB. Head rather broad; eye large, 3 in head, greater than the width of the broad interorbital space; snout blunt; barbels well developed; mouth rather larger than in the next; color olivaceous or bluish, sides silvery, often with a dusky band; D. I, 8; A. I, 8; lat. l. 38. Ohio Valley; resembles somewhat *Cliola ariomma*, but has a very different mouth.

4. ***C. winchelli,*** (Grd.) Jor. CLEAR CHUB. Head narrower; eye large, 3 in head, much wider than the narrow interorbital space; snout moderately blunt; barbels short; colors darker, a dark lateral stripe. Tennessee River and South, perhaps a variety of the preceding. (*C. hyalinus*, Cope.)

aa. Lateral line 45 to 50; long, slender species, with the head elongate; lips more developed; teeth 4—4.

5. ***C. dissimilis,*** (Kirt.) Cope. SPOTTED SHINER. Pale olivaceous, sides bright silvery, with a bluish lateral band, widened at intervals into spots; fins immaculate; depth 5 in length; head 4; eye large, 3½ in head; D. I, 8; A. I, 7; lat. l. 47 to 50; L. 6. Ohio Valley and Lake region, not uncommon.

†† Dorsal fin inserted distinctly behind ventrals; lips greatly developed; a black blotch on last rays of dorsal.

6. ***C. monachus,*** Cope. SOLITARY CHUB. Form elongate, as in *Phenacobius;* a dark caudal spot; eye small, 4 in head; lat. l. 56. Tennessee R. Several

brightly colored species allied to this occur farther South.

** Mouth terminal; teeth 2, 4—4, 2; size large; dorsal very slightly behind ventrals. (Genus *Couesius*, Jor.)

7. ***C. prosthemius,*** Cope. Lake Chub. Depth 5 in length, equal to length of head; eye 4 in head; snout blunt; mouth small; dusky above, sides plumbeous; lat. l. 63; L. 6 to 7. Great Lakes.

8. ***C. milneri,*** Jordan. Milner's Chub. Depth $4\frac{1}{2}$ in length, equal to head; head flattish above, with a broad snout which projects over the large oblique mouth; barbel well developed; eye large, $3\frac{2}{3}$ in head; D. I, 8; A. I, 8; lat. l. 68; scales crowded forwards; colors of *Semotilus corporalis*, but the fins unspotted. Lake Superior.

22. RHINICHTHYS, Agassiz. Long-Nosed Dace.

= *Argyreus*, Heckel (preoccupied.)

* Snout projecting considerably beyond the mouth; body slender, depth usually 5 to 6 in length; barbels evident.

1. ***R. cataractæ,*** (C. & V.) Jor. Long-Nosed Dace. Brownish, mottled, not banded; eye half the length of the long snout; head $3\frac{4}{5}$ in length; D. I, 8; A. I, 7; lat. l. 63; L. 5. New England to Va. and Wis., in clear brooks. [*R. nasutus*, (Ayres) Ag.]

2. ***R. marmoratus,*** Ag. Marbled Dace. Brown, marbled; eye $2\frac{1}{2}$ in snout; head $4\frac{1}{4}$ in length; lat. l. 70. Great Lakes. (Doubtfully distinct.)

** Snout scarcely projecting; body stout; depth 4 to 5 in length; barbels scarcely visible.

† A distinct dark band from snout to caudal (red in spring.)

3. ***R. atronasus,*** (Mitch.) Ag. Black-Nosed Dace. Dusky, belly silvery; lateral band bright crimson in

spring, becoming orange in summer, black at other times; fins often rosy in spring; depth $4\frac{2}{3}$ in length; head $3\frac{3}{4}$; D. I, 8; A. I, 7; lat. l. 65. New England to Ohio Valley, in clear brooks; abundant Eastward.

4. ***R. obtusus,*** Ag. Brown-Nosed Dace. Similar; sides with a brown band, edged above and below with paler; head 4 or more in length; D. I, 8; A. I, 8; lat. l. 63 to 70. Western streams. Usually paler than the preceding and more robust in form; probably a variety rather than a distinct species. (*R. lunatus*, Cope.)

*** Snout projecting; barbels quite evident; form stoutest; depth $4\frac{1}{4}$ in length.

5. ***R. meleagris,*** Agassiz. Head 4—$4\frac{1}{2}$ in length; barbels long and distinct; snout projecting, narrowed, overlapping the lower jaw; eye small, 5 in head; D. I, 7; A. I, 7. Illinois and Iowa.

23. *EXOGLOSSUM,* Rafinesque. Stone Toters.

1. ***E. maxillilingua,*** (LeS.) Haldeman. Day Chub. Cut-Lips. Nigger Chub. Body stout; depth $4\frac{1}{4}$ in length, head 4; eye small, nearly 5 in head; dorsal behind midway between snout and caudal; dusky above, a blackish shade along caudal peduncle; D. I, 8; A. I, 8; lat. l. 50 to 55; L. 4 to 6. W. N. Y. (Susquehanna basin) to Virginia; a fish of remarkable appearance, singularly distinguished from all our other *Cyprinidæ* by the three-lobed lower jaw.

24. *CARASSIUS,* Nilsson. Crucian Carps.

1. ***C. auratus,*** (L.) Bleeker. Gold Fish. Orange or blackish, rarely pale; D. I, 19; A. I, 8; lat. l. 26; exceedingly variable in domestication. Asia; common every where in aquaria, and now naturalized in many of our eastern streams.

25. CYPRINUS, Linnæus. CARPS.

1. ***C. carpio,*** L. EUROPEAN CARP. Olivaceous; D. III, 20; A. III, 5; lat. l. 37. European, introduced into some eastern rivers.

FAMILY CIX.—CATOSTOMIDÆ.

(*The Suckers.*)

Cyprinoid fishes of medium or large size, with the pharyngeal teeth in a single series, very numerous and closely set; intermaxillaries forming but a small part of the upper arch of the mouth, the maxillaries entering into it extensively on each side; mouth toothless, with fleshy lips, extremely protractile, roundish when fully protruded; dorsal fin long; anal short and rather high; no barbels; scales large; head naked; air bladder large, divided into two or three parts by transverse constrictions. Genera twelve, *Pantosteus*, Cope, and the following; species about fifty, abounding every where north of Mexico; one genus (*Myxocyprinus*) occurs in China, and a species of *Catostomus* in Siberia; all the rest are North American.

* Body oblong or elongate, with a short, sub-quadrate dorsal fin of 10 to 17 developed rays; anal rays uniformly 7. (*Catostominæ.*)

† Mouth singular; the upper lip not protractile, greatly enlarged; the lower lip developed as two separate lobes; the lower jaw provided with a sheath.

a. Air bladder in three parts; scales large, sub-equal; pharyngeal bones and teeth ordinary; fontanelle well developed; lateral line present. . . . . . QUASSILABIA, 1.

†† Mouth normal, the lower lip undivided or merely lobed—either tuberculate or plicate.

b. Air bladder in three parts; lateral line present; fontanelle present; scales large, sub-equal; ventral rays normally, but not constantly, 9.

c. Pharyngeal bones very broad and strong; the lower 7 to 10 teeth on each side, greatly enlarged and truncate; the teeth on the upper part of the bone small, as usual in the family. . . PLACOPHARYNX, 2.

cc. Pharyngeal bones not especially enlarged; the teeth strongly compressed, of the usual type. MYXOSTOMA, 3.

bb. Air bladder in two parts.

d. No lateral line. . . . . ERIMYZON, 5.

dd. Lateral line imperfect. . . MINYTREMA, 4.

ddd. Lateral line well developed; lips tuberculate.

e. Fontanelle distinct; no mandibulary sheath.

f. Scales moderate, not crowded forwards, about equal over the body; body long and little compressed; head transversely concave between orbits, long and flattened; the physiognomy being therefore peculiar; ventral rays 9. HYPENTELIUM, 6.

ff. Scales small, smaller anteriorly and much crowded; head transversely convex between orbits; ventral rays normally 10. CATOSTOMUS, 7.

* Body much elongated, sub-cylindrical forwards; dorsal elongate, falciform, of 30 or more rays; fontanelle obliterated by the union of the parietal bones. (*Cycleptinæ.*)

g. Mouth small, subinferior, with papillose lips; scales rather small. . . . . CYCLEPTUS, 8.

*** Body oblong oval, compressed; dorsal elongate, elevated in front, of 20 or more rays; fontanelle present. (*Bubalichthyinæ.*)

h. Dorsal rays about 30 in number (24 to 33); anal rays about 10 (9 to 12); scales large.

i. Pharyngeal bones narrow, with the teeth relatively thin and weak.

j. Mouth small, inferior, protractile downwards; dorsal fin often greatly elevated. . . . CARPIODES, 9.

jj. Mouth larger, sub-terminal, protractile forwards (species of larger size, dusky colors, with lower dorsal).
ICHTHYOBUS, 10.

ii. Pharyngeal bones strong; the teeth comparatively coarse and large, increasing in size downwards; dorsal fin moderately elevated; mouth inferior. BUBALICHTHYS, 11.

1. ***QUASSILABIA,*** Jordan & Brayton. HARE LIP SUCKERS.

(*Lagochila*, J. & B., preoccupied.)

1. ***Q. lacera,*** Jor. & Brayt. HARE LIP SUCKER. SPLIT MOUTH SUCKER. Head short, 4⅔ in body, with lengthened, non-protractile fleshy snout; body elongate, its depth about 5 in length; eye medium, set far back, the opercle small; fins not large; scales, etc., as in *Myxostoma;* D. I, 12; A. I, 7; V. 9; lat. l. 45. Tennessee and Cumberland Rivers; a most remarkable species, bearing the same relation to the other *Catostomidæ*, that *Exoglossum* does to the other *Cyprinidæ*. It seems to possess real affinities with *Exoglossum*.

2. ***PLACOPHARYNX,*** Cope. PLACOPHARYNX.

1. ***P. carinatus,*** Cope. COPE'S SUCKER. Resembles *M. anisura*, but the lips and pharyngeal bones quite different; eye 4½ in head; head 4 in length; depth 3⅔· head strongly ridged above; pharyngeal bones very heavy, the lower 7 to 12 teeth on each side very large, scarcely compressed; truncate, irregularly placed; D. I, 14; A. I, 7; lat. l. 41; head with a median ridge on top; a large, coarse species similar in general characters to *Myxostoma*, but with the physiognomy approaching somewhat that of *Ichthyobus*. It is probably common in the Western streams, although it was not noticed until 1870. I have specimens from the Illinois, Wabash, Detroit, Falls of the Ohio and the Scioto, and French Broad.

3. *MYXOSTOMA,* Rafinesque. RED HORSE.

(*Moxostoma et Teretulus*, Raf.)

(*Ptychostomus*, Agassiz.)

* Lower lip not infolded and "∧ shaped;" lips distinctly plicate.

† Lower lip full, its posterior edge truncate or slightly rounded.

a. Species with the body distinctly compressed, the depth 3½ to nearly 5 in length.

b. Dorsal fin largely developed, the rays 15 to 18 in number.

1. ***M. carpio,*** (Cuv. & Val.) Jordan. WHITE MULLET OF THE LAKES. Head rather large, $3\frac{2}{3}$ to $4\frac{1}{4}$ in length, broad above; mouth large, with full lips; eye rather large; body deep, strongly compressed; the back somewhat elevated, the depth about $3\frac{1}{4}$ in length; dorsal fin high and large, larger than in any of the others; scales 5—43—4,* quite large; coloration very pale and silvery, the lower fins white. Great Lakes, and occasionally in the Ohio River; a handsome and well defined species.

bb. Dorsal fin moderate, its rays 12 to 14 in number.

c. Caudal fin normal, the two lobes about equal and similarly colored.

d. Scales large, 41 to 50 in the course of the lateral line.

e. Head singular in form, much shortened, the muzzle very abruptly decurved, descending almost perpendicularly in front of the eye; the head wedge-shaped from behind forwards, and less so from below upwards, its sides subvertical and the lower cross-diameter of the head greater than the upper.

2. ***M. euryops,*** Jordan. SNUB-NOSED SUCKER. Eye very large, more than one-third the length of the side of the head (in an individual of six inches in length);

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* That is, 43 scales in the lateral line, 5 rows between the lateral line and the dorsal fin, and 4 between it and the ventrals.

lips thin, very faintly plicate; width of head through the opercles greater than the thickness of the body; head 4⅓ in length; depth about the same; dorsal rays 13; scales 6—43—5; body shortish, closely compressed, the back somewhat elevated, and the caudal peduncle unusually long in proportion; color smoky blue; lower fins white; size probably small. Alabama River.

ee. Head normal in form, not as above.

f. Mouth moderate or large, not very small, nor very much overpassed by the muzzle; lips thick, strongly plicate; body stoutish, varying to moderately elongate; dorsal fin medium, its developed rays 12 to 14, usually 13 in number; scales large, about 6—45—5; lower fins in the adult red or orange.

3. ***M. macrolepidota,*** (LeS.) Jordan. RED HORSE. COMMON MULLET. Head comparatively elongate, 4 to 5 in length; mouth large; size very large, reaching a length of two feet or more. U. S., east of the Great Plains, every where common, except in New England.

Var. ***duquesnii,*** (LeS.) Jordan. COMMON RED HORSE. WHITE SUCKER. Head quite elongate, 4 to 4⅗ in length; back little elevated; body rather elongate, not greatly compressed; scales pretty large, 6—42 to 49—5; back bluish or olive; sides brilliantly silvery, with bright reflections; dorsal fin dusky above; lower fins bright red. Ohio River and Southward, very abundant, the common "Red Horse" in most regions.

Var. ***lachrymalis,*** (Cope) Jordan. Southern R. Head a little shorter, 4⅓ to 4⅗ in length; form of the preceding; scales distinctly smaller, 7 or 8—48 to 50—6; back with much smoky shading. Virginia to Alabama.

Var. ***macrolepidota,*** (LeS.) Jor. LAKE MULLET. EASTERN RED HORSE. Head still shorter and deeper, 4½ to 5 in length; its upper profile concurrent with the curve of the back, which is considerably elevated; the form being thus somewhat elliptical; sides compressed; dorsal rays usually 13; coloration little silvery, the sides reflecting brownish and golden; back smoky, some of the scales dusky at base; scales 6—42 to 50—5. Great Lakes and streams Eastward, from Vermont to South Carolina. (*P. robustus*, Cope, *C. oneida*, DeKay.)

4. ***M. aureola,*** (LeS.) Jordan. GOLDEN RED HORSE. LAKE MULLET. Head comparatively short, low and small, 5 to 5½ in length; back elevated and compressed; depth 3⅓ in length; mouth rather small, more or less overpassed by the snout; coloration bright yellowish brown, etc., not silvery; lower fins bright red; dorsal rays 13; scales 6—42 to 48—5; size large. Great Lakes, Ohio Valley and Northward.

ff. Mouth very small, much overpassed by the conic muzzle; head small, about 5 in length.

5. ***M. crassilabris,*** (Cope) Jordan. THICK-LIPPED MULLET. Body flattish, the back elevated and compressed; depth 3¾; muzzle contracted; scales large, 5—44—5; dorsal rays usually 12; dorsal fin elevated in front, its first soft ray longer than the base of the fin; color silvery, with smoky shading above, some of the scales blackish at their bases; lower fins white; top of head, humeral bar and dorsal fin dusky. Neuse River.

6. ***M. conus,*** (Cope) Jordan. CONE-HEADED SUCKER. Body flattish, the dorsal outline elevated, the form being like that of *M. coregonus;* head small and conic; mouth exceedingly small, the snout far overpassing it, the muzzle being much longer than in *M. crassilabris;* dorsal rays 14; eye large; coloration smoky above, some scales dusky at their bases; sides pale; lower fins white. Yadkin River.

dd. Scales very small for the genus, about 9—56—8 in number; body moderately elongate, the depth about 4 in the length.

7. ***M. albida,*** (Grd.) Jor. White Sucker. Head shortish, conic, the snout not much projecting, about 4 in length; eye large; dorsal fin small, with about eleven rays, the last rapidly shortened; (characters of mouth unknown, but probably similar to *macrolepidota* and *pœcilura;* it is said to be "much larger than in *P. congestus.*") Rivers of the Southwest.

cc. Upper lobe of the caudal falcate, much longer than the lower (nearly an inch longer in specimens a foot long); the lobes similarly colored; dorsal fin falcate.

8. ***M. anisura,*** (Raf.) Jor. Long-Tailed Sucker. Body compressed; back somewhat elevated; depth 3½ in length; head conic, flattish, 5¼ in length; mouth very small, much as in *aureola*, which this species much resembles; the short high dorsal and peculiar caudal, however, distinguish it; D. 12—13, half higher than long; scales 6—46—5. Lakes and Ohio Valley. (*C. anisurus*, Raf., not of Kirt., nor of Agassiz. *P. breviceps*, Cope.)

ccc. Lower lobe of the caudal very much longer than the upper and differently colored, the upper lobe in the adult being red, the inferior jet-black, its two lowermost developed rays and their membranes abruptly white (? in both sexes).

9. ***M. pœcilura,*** Jordan. Variegated-Tailed Mullet. Body elongate, moderately compressed, somewhat elevated forwards; depth 4⅓ in length; head about the same; mouth medium, the lips full; dorsal rays 13; scales large, 5—44—4, coloration usual except of the caudal fin; other fins all red, with blackish shadings; size small. Lower Mississippi River.

aa. Species with the body elongate, little compressed, broad; the depth, about 5 in length, not very much greater than the thickness.

10. ***M. cervina,*** (Cope) Jordan. JUMP-ROCKS. JUMPING MULLET. Head very short, roundish above, rather pointed forwards, about 5 in length; cheeks sub-vertical; mouth rather large, with thick lips, which are strongly plicate, the folds somewhat broken up; eye small; fins very small, the dorsal rays 10 to 12; scales rather large, 6—44 to 49—5; color greenish brown, a pale blotch on each scale, these forming continuous streaks along the rows of scales; back with more or less distinct brownish cross-blotches; fins brownish, not much red; the dorsal blackish at tip; size smallest; length less than a foot. Virginia to Georgia, very abundant, a singular little species.

†† Lower lip thin, forming a narrow, crescent-shaped border around the mandible.

11. ***M. alba,*** (Cope) Jordan. WHITE MULLET. Head small, five times in length; muzzle prominent, but less so than in *M. velata;* mouth moderate, back a little elevated; depth about $3\frac{1}{3}$ in length; dorsal rays 12 to 14, its free border incised; scales 6—45—5; coloration very pale; lower fins white; size large; reaches a weight of four pounds or more. Rivers of N. C.

12. ***M. thalassina,*** (Cope) Jordan. GREEN MULLET. Head stout, as in *M. velata*, rather long, 4 in length, flattish above, muzzle truncate, not very prominent; muzzle moderate; back elevated; dorsal fin long, of 14 or 15 rays; sea-green above; white below; lower fins white. Yadkin River.

** Lower lips infolded, ʌ-shaped, when viewed from below, with a distinct median crease, in which the two halves of the lip meet, forming an acute angle; mouth small.

Lips plicate, the folds not broken up into papillæ.

g. Dorsal rays (developed) 16 (15 to 17.)

13. ***M. velata,*** (Cope) Jordan. SMALL-MOUTHED RED HORSE. WHITE NOSE. Body stout, deep, compressed, the back elevated, the depth 3 to 4 in length; head short, heavy, flattish and broad above, thick through the cheeks, 3¾ to 4¼ in length; eye rather large, midway in head, 4 to 5 in its length; muzzle rather prominent, bluntish, overhanging the very small mouth; fins very large; dorsal long and high, its height five-sixths the length of the head; pectorals nearly reaching ventrals; color silvery, smoky above; lower fins red; size large. Great Lakes to North Carolina and Alabama, rather common. (*P. collapsus* and *P. velatus*, Cope.)

gg. Dorsal moderate, with 12 to 14 developed rays

h. Head comparatively large, about 4 in length; dorsal rays usually 12.

14. ***M. congesta,*** (Grd.) Jordan. THICK-HEADED MULLET. Head short and very wide through the opercles, flat above; body stout, the back somewhat elevated; depth 4 in length; muzzle sub-truncate, slightly projecting; scales 6—40—5; olivaceous, silvery below; dorsal fin dusky. Missouri River and S. (*P. bucco*, Cope.)

15. ***M. pidiensis,*** (Cope) Jordan. MULLET OF THE GREAT PEDEE. Head rather long, 4½ in length, flattish above; body elongate, more nearly cylindrical, little compressed; muzzle truncate; olivaceous, sometimes with rows of faint spots along the series of scales; dorsal and caudal fins black-edged; size quite small; resembles *M. cervina*, but the mouth entirely different. Great Pedee River.

hh. Head very small, about 5 in length; muzzle conic, much projecting beyond the very small mouth.

16. ***M. coregonus,*** (Cope) Jordan. WHITE-FISH MULLET. Broadly fusiform, the body being much com-

pressed, the back elevated and arched; dorsal rays 14; color silvery, with plumbeous shades above; lower fins white; size small. Catawba and Yadkin Rivers.

‡‡ Lips papillose, the plicæ broken up by cross furrows.

17. ***M. papillosa,*** (Cope). Jordan. PAPILLOSE MULLET. Body comparatively stout, the dorsal region somewhat elevated and rounded, the depth being about 4 in length, the head about the same; eye rather large, high up and well back, the preorbital space being longer than in the other species; top of head flat; dorsal rays 12 to 14; scales rather large, 6—42—5; lips well developed, deeply incised, almost as in *Catostomus;* color silvery; back with smoky shading; lower fins white; size large, reaches a length of about two feet. North Carolina to Georgia.

4. *MINYTREMA,* Jordan. STRIPED SUCKERS.

* Each scale with a large, square blackish spot at its base, these forming more or less conspicuous stripes along the sides; body subterete, becoming deeper with age.

1. ***M. melanops,*** (Raf.) Jordan. SPOTTED MULLET. STRIPED SUCKER. Head $4\frac{2}{3}$ in length; depth about 4; scales very large; blackish above; sides coppery, with black stripes; D. I, 12; lat. l. 47; size large; adult males with the sides of the head profusely tuberculate in Spring; young specimens of this species have no trace of lateral line, as in *Erimyzon;* older ones (6—8 inches) show a deepening of the furrows along the median series of scales; adults of 12 to 18 inches show a series of completely developed tubes, which, however, are wanting on some of the scales, especially behind; as *Erimyzon* never shows any traces of the tubes of the lateral line, these peculiarities may be held to indicate generic distinction, and the name *Minytrema* is here

proposed for *E. melanops*. Great Lakes, Ohio Valley and South, abundant; one of our handsomest suckers, strangely overlooked by recent writers. This and the next, unlike most of our suckers, are very hardy in the Aquarium.

5. *ERIMYZON,* Jordan. Chub Suckers.

=*Moxostoma*, Agassiz (not of Raf.)

* No stripes along the rows of scales, body rather short and deep.

1. ***E. sucetta,*** (Lac.) Jordan. Creek Fish. Chub Sucker. Head 4 to $4\frac{1}{2}$ in length; depth $2\frac{3}{4}$, in adult; eye 5 in head; scales crowded, deeper than long; no trace of lateral line; dusky above, brassy on sides and below; very variable; young much less compressed, with black bands or bars, and pale lateral and vertebral streaks; spring males with six tubercles on head; D. I, 11; lat. l. 40. New England, S. and W., abundant. [*E. oblongus*, (Mit.) Jor.]

6. *HYPENTELIUM,* Rafinesque. Crawl-a-Bottoms.

=*Hylomyzon*, Ag.

1. ***H. nigricans,*** (LeS.) Jordan. Stone Roller. Hog Sucker. "Mud Sucker." Depth $4\frac{3}{4}$ in length; head 4; depth of head $\frac{2}{3}$ its length; eyes small, very high up and far back; lower fins very large; pectoral nearly as long as head; brownish, often beautifully marbled; D. I, 11; A. 8; lat. l. 52. Lakes and streams from N. Y., S. and W., abundant; one of our most singular fishes. It frequents clear streams and rapids, and it is not at all a "mud fish," as some writers seem to suppose.

7. *CATOSTOMUS,* LeSueur. Fine-Scaled Suckers.

$>$ *Acomus* and *Minomus*, Grd.

* Lateral line with 60 to 65 scales· snout comparatively short; (*Decadactylus*. Raf.)

1. **C. teres,** (Mit.) LeS. COMMON SUCKER. WHITE SUCKER. Depth about equal to length of head, 4 to 4½ in length; olivaceous, sides silvery, with bright reflections; males with the sides roseate in spring; D. I, 12; lat. l. 63. U. S., abundant every where east of the Rocky Mountains. (*C. communis*, *bostoniensis*, *teres*, *sucklii*, etc., of authors.)

** Lateral line with about 100 scales; snout much produced. (*Catostomus.*)

2. **C. longirostris,** LeS. RED-SIDED SUCKER. LONG-NOSED SUCKER. Slender, depth less than length of head; sides with a bright red band, and upper part of head with small tubercles in males in Spring; D. I, 10; lat. l. 110. Great Lakes, Upper Mississippi and Northward, abundant. [*C. hudsonius*, LeS., *C. aurora*, Ag.; *C. griseus* and *C. lactarius*, Grd.; *C. forsterianus*, (Rich.) not *C. forsterianus*, Ag., which is probably *C. commersonii.*]

8. CYCLEPTUS, Rafinesque. SUCKERELS.

= *Rhytidostomus*, Heckel.

1. **C. elongatus,** (LeSueur) Ag. BLACK HORSE. GOURD-SEED SUCKER. MISSOURI SUCKER. Body fusiform, not greatly compressed; head and mouth very small; depth four to five in length; head 6¼; eye small, well back, 6 to 7 in head; lobes of dorsal and caudal much attenuated; longest dorsal rays a little longer than head; pectorals falcate, as long as head; anal fin small; scales with the exposed surfaces broad; ♂ jet black above, sides black with a coppery luster; snout minutely tuberculate in spring; ♀ olivaceous; D. 30; A. 7; lat. l. 56; length 2 to 3 feet; weight 2 to 15 lbs. Mississippi Valley, in large streams. A singular species, quite unlike any other.

9. CARPIODES, Rafinesque. CARP SUCKERS.

* First rays of dorsal very much elevated and attenuated, about as long as the base of the fin.

† Muzzle conic, projecting.

1. **C. velifer,** (Raf.) Ag. SPEAR FISH. SAIL FISH. QUILLBACK. SKIMBACK. Muzzle conic, much less obtuse than in the next; depth $2\frac{1}{2}$ in length; head $3\frac{3}{4}$; eye $4\frac{1}{4}$ in head; color pale, scarcely silvery, as in all the species; D. 22; lat. l. 37. Ohio R.

‡‡ Muzzle very abruptly obtuse.

a. Anterior suborbital bone sub-triangular, longer than deep.

2. **C. selene,** Cope. MOON CARP-SUCKER. Back steeply elevated; intermaxillaries far in advance of orbit; D. 26; V. 10; A. 8; lat. l. 37; silvery. Great Lakes, abundant.

aa. Anterior suborbital bone, much deeper than long.

3. **C. cutisanserinus,** Cope. LONG-FINNED CARP SUCKER. Mouth usual in position, the upper lip in advance of the nostrils, etc.; dorsal fin beginning mid-way of body more elevated than in any other species; snout with small tubercles in spring males; head 4 in length; depth $2\frac{3}{5}$; D. 26; V. 10; A. 8. Ohio Valley, abundant.

4. **C. difformis,** Cope. DEFORMED CARP SUCKER. Eye very large, and well anterior; the front edge of the lower jaw in line with the anterior rim of the orbit, and the end of the upper lip reaching the line of the anterior rim of the orbit, the physiognomy being therefore peculiar in the great obtuseness of the head; insertion of dorsal anterior to middle of the head; D. 24; A. 8; V. 9; lat. l. 35. Ohio River.

** Anterior rays of dorsal scarcely filamentous, little more than half the length of the base of the fin.

b. Head comparatively large, $3\frac{1}{2}$ to 4 in length.

5. ***C. bison,*** Ag. BUFFALO CARP SUCKER. Muzzle very long, conic; eye median, large, 4½ in head; body elongate; depth 3 in length; dorsal fin elongate, nearly as much so as in *C. velifer;* D. 28; lat. l. 40. Mississippi Valley.

6. ***C. cyprinus,*** (LeS.) Ag. SILVERY CARP SUCKER. Muzzle prominent, but rather obtuse; eye small, anterior, 5 in head; depth 2¾ in length; longest dorsal rays about ⅔ the length of the base of the fin; D. 28, or 29; lat. l. 40. N. Y. to Ala., East of the Alleghenies.

bb. Head smaller, 4¼ to 5 in length.

7. ***C. thompsoni,*** Ag. LAKE CARP SUCKER. Short and stout; dorsal region much arched; scales narrowly exposed; longest dorsal ray reaching the 22d; eye small, 5¼ in head; head 4¼ in length; depth 2½; D. 28; lat. l. 41. Great Lakes.

8. ***C. carpio,*** (Raf.) Jordan. RIVER CARP SUCKER. Body more elongate, the depth 3 in length, the head small, nearly 5; longest dorsal rays shortest, reaching to the 16th ray; eye small, anterior; D. 30; lat. l. 36, the largest species, approaching *Ichthyobus.* Ohio Valley, abundant. (*C. nummifer*, Cope.)

10. ***ICHTHYOBUS,*** Rafinesque. BUFFALO FISH.

(*Sclerognathus*, Val.)

* Body robust, little compressed, the dorsal region not especially elevated.

1. ***I. bubalus,*** (Raf.) Ag. BROWN BUFFALO-FISH. Depth 3½ in length; head the same; eye small, 6½ in head; depth of head five-sixths its length; opercle very wide, forming nearly half the length of head — convex and furrowed; scales very large; dull brownish olive, not silvery; D. 27; A. 10; lat. l. 40; length (of specimen)

27 inches; weight 15 lbs. Mississippi Valley (described from specimen from Wabash R.)

** Body shorter, considerably compressed; the dorsal region elevated. (These three the young of the preceding!)

2. ***I. cyanellus,*** Nelson. Blue Buffalo. Head $3\frac{1}{3}$ in length; depth $2\frac{1}{2}$; eye $4\frac{1}{2}$ in head; longest dorsal ray reaching 18th; head very short, high and thick; mouth quite small, oblique, somewhat overlapped by the obtuse snout; insertion of dorsal rather anterior; steel blue, paler below; D. I, 30; lat. l. 38. Illinois River.

3. ***I. rauchii,*** Ag. "Dorsal much higher than in *I. bubalus;* all other fins much larger and scales not higher than long." (Ag.) Mississippi River, Burlington, Iowa. An unrecognized species. Specimens in my collection from near Burlington agree with *I. cyanellus*, except that the insertion of the dorsal is midway.

4. ***I. ischyrus,*** Nelson. Heavy Buffalo. "This is a very stout and heavily built species; depth $2\frac{1}{2}$ in length; head extremely broad between the eyes and but slightly convex; its length $3\frac{1}{2}$ times in length of body; snout short and rounded, opercular apparatus large; depth of head $1\frac{1}{5}$ in its length; width of head $1\frac{1}{2}$; eye $6\frac{2}{3}$ in head, $1\frac{2}{3}$ in snout, 4 in interorbital space; caudal peduncle a little deeper than long; scales 7—37—7, nearly uniform, a little crowded anteriorly, finely punctate; fins all small; dorsal I. 27; A. I, 8; bluish-olive above, yellowish below; fins blackish." (*Nelson.*) Rivers of Illinois.

11. ***BUBALICHTHYS,*** Agassiz. Buffalo Fishes.

1. ***B. urus,*** Ag. Black Buffalo. Big-Mouthed Buffalo. Body much less elevated and less compressed than in *B. bubalinus*, the back not at all carinated; axis of body over the ventrals about at the

lateral line, and but an eighth or tenth further from the dorsal line than the ventral; greatest depth midway of body over ventrals and just in advance of dorsal; depth $3\frac{1}{8}$ in length; head strongly transversely convex, almost ridged above, less narrowed downwards than in *bubalus;* greatest depth of head $1\frac{1}{8}$ in its length; interorbital space $2\frac{1}{8}$; eye=snout $5\frac{1}{2}$ in head, much smaller than in *bubalus;* snout scarcely projecting; no depression at occiput; an almost even curve from snout to dorsal; head bounded by curves, therefore not triangular, thicker, larger, and less pointed than in *bubalus;* mouth large, with a large and pappillose lower lip; mandible longer than eye; scales 8—41—7; fin rays D. I, 30; A. I, 11; dorsal not so high nor so rapidly depressed as in *bubalus*, the longest ray scarcely half the length of the base of the fin, reaching to the 15th, the 9th ray, half the height of the first; anal reaching caudal, its middle rays more rounded, not so much shorter than the first; pectorals as long as ventrals, both longer than anal and less than head; colors very dark; fins all black. Mississippi and Ohio Rivers.

2. ***B. altus,*** Nelson. DEEP-BODIED BUFFALO. Body very deep and much compressed; the back is much arched and the profile descends steeply in front to end of snout, not forming an angle with it as in many species of *Ichthyobus;* depth of body $2\frac{1}{2}$ in length; head 4 in length; greatest thickness of body $1\frac{2}{5}$ in length of head; depth of head $1\frac{1}{5}$ in its length; width $1\frac{1}{2}$ in length; eye $5\frac{1}{2}$ in head, $2\frac{1}{2}$ in interorbital space, which is but little rounded; lateral line perfectly straight from upper edge of opercle to caudal; scales 8—35—5; dorsal I. 25; A. I, 9; color in spirits, dull yellowish-olive; fins dusky. Illinois. (*Nelson.* Same as the next!)

3. ***B. bubalus,*** Agassiz. SMALL-MOUTHED BUFFALO. Body considerably elevated and compressed above; the dorsal region sub-carinate; belly thicker; depth $2\frac{3}{4}$ in length; axis of the body above the ventrals, below the lateral line and nearly twice as far from the back as the belly; greatest depth of body at beginning of dorsal, which is in advance of ventrals, and a trifle nearer the snout than the caudal; head wide, rounded across the top, wider above eyes than across cheeks; interorbital space 2 in head; head 4 in length of body, its greatest depth $1\frac{1}{8}$ in its length; eye=snout 4 in head, much larger than in *B. niger;* mouth small, notably smaller than in *B. niger*, and with thinner lips, which are granulated and feebly plicate; mandible about equal to eye; pharyngeal bones very strong, with large teeth, which grow larger downward; intestinal canal long, longer than body; a decided occipital depression; head triangular in outline, viewed from the side; ante-orbital region strongly elevated and curved; length of top of head $2\frac{3}{4}$ in distance from snout to occiput; nostrils large; scales 8—40—6 in two specimens, 8—39—6 in one, 7—39—5 in the fourth; fin rays D. I, 28 in two, I. 29 in rest; A. I, 10; V. 10; dorsal elevated in front and rapidly declined, the seventh ray half the length of the third or longest; the latter reaches to the base of the 18th ray, or more than half the base of the fin; anal reaching caudal, its rays rapidly shortened; pectorals shorter than anal, anal than ventrals, all than head. Mississippi Valley, abundant. (*B. bubalus*, Ag., not *C. bubalus*, Raf.)

ORDER AA.—NEMATOGNATHI.

(The Sheat Fishes.)

Skin naked or with bony plates; no true scales; barbels always present, maxillary bone rudimentary and forming the base of the longest barbel; margin of upper jaw formed by intermaxillaries only; sub-opercle absent; air bladder generally present; usually an adipose fin, and in all our species a spine in the dorsal and pectorals; ventrals abdominal. Chiefly fresh water fishes, inhabiting most regions, especially abounding in South America. The leading family is *Siluridæ.*

FAMILY CX.—SILURIDÆ.

(The Cat Fishes.)

General characters as above given; genera one hundred or more; species nearly seven hundred; a very large family abounding in the fresh waters of America and the warmer parts of the Old World; a few are marine. Our species constitute a peculiar group termed by Dr. Gill *Ichthæluri.* The characters of this group are as follows: The body is more or less elongated, compressed posteriorly, and terminating in a well-developed caudal fin. The skin is naked and unprovided with sucking cups; the head in profile presents the appearance of a more or less elongated cone, and is covered with a skin which is generally quite thick; it is more or less flattened, and broad above, and gradually becomes narrowed to the convex snout; there is never a casque, or helmet; the supraoccipital terminates in a point; there are eight barbels: the two maxillary, constant in the family; a pair in front of the posterior nasal apertures; and two pairs arranged in a curved line behind the lower jaw; the nostrils form nearly a transverse parallelogram between the intermaxillaries and the eyes; the anterior are suboval or subcircular, and the posterior linear, with a raised margin, from the front of which the upper barbels originate; the eyes are generally placed in the anterior half of the head; the dorsal and pectoral fins are each provided with a stout, pungent spine. The adipose fin is developed, not rayed, and the rays of the dorsal fin are few in number. The branchial apertures are ample, continued from the supero-posterior angles of the opercula to beneath the throat. The air-bladder is well developed. The species commonly inhabit deep or sluggish waters, and are very tenacious of life—especially those of *Amiurus*.

* Adipose fin with its posterior margin free, not connected with the caudal fin.

† Intermaxillary band of teeth convex in front, abruptly truncate behind, without lateral backward processes; branchiostegals 8 or 9 (rarely 10 or 11); ventral fins normally with 8 rays.

‡ Supraoccipital bone prolonged backward, its apex emarginate, receiving the pointed anterior end of the second interspinal, thus forming a continuous bony bridge from the snout to the base of the dorsal; branchiostegals 8 or 9; head elongate; mouth small, terminal, the upper jaw the longer; anal fin elongate, of 24 to 34 rays; caudal fin furcate; body elongate, more or less slender, silvery, covered with thin skin. . . ICHTHÆLURUS, 1.

‡‡ Supraoccipital bone free behind, not connected with the interspinal; branchiostegals normally 9 (varying from 8 to 11); head broad; mouth broad, terminal; anal fin moderate or rather long, with 15 to 27 rays; caudal fin usually truncate, but often more or less deeply emarginate or even forked; body usually more or less shortened, covered with a rather thick skin. . . . . . . AMIURUS, 2.

†† Intermaxillary band of teeth convex in front, with a lateral backward extension on each side; branchiostegals nor-

mally 12; supraoccipital bone free behind; head long, broad, and flat; mouth large, the lower jaw always the longer; anal fin short, of 12 to 14 rays; ventrals with 9 rays; caudal fin truncate, its numerous rudimentary rays recurrent above and below the caudal peduncle; number of vertebræ increased; body elongate, covered with thick skin.
PELODICHTHYS, 3.

** Adipose fin long and low, keel-like, adnate to the back, more or less perfectly continuous with the caudal fin; supraoccipital bone free behind; branchiostegals 9; anal fin short, with 11 to 20 rays; caudal fin rounded, with numerous rudimentary rays recurrent on the caudal peduncle; ventral rays usually 9; form various, but body usually more or less elongate, depressed in front, compressed behind, covered with a thickish but semi-transparent skin; size small.
NOTURUS, 4.

1. *ICHTHÆLURUS*, Rafinesque. CHANNEL CATS.

* Eye small, anterior, the middle of the head being behind its posterior margin.

† Anal fin extremely elongate, its base one-third the length of the body; its rays 32 to 34; body slender.

1. ***I. furcatus***, (Cuv. & Val.) Gill. FORK-TAILED CHANNEL CAT. Head small, 4½ in length, the slope from dorsal to snout somewhat concave; spines long. Mississippi Valley, and Southwest.

†† Anal fin shorter, 3½ to 4 in length; its rays 27 to 30; body robust, compressed.

2. ***I. robustus***, Jordan. ROBUST CHANNEL CAT. A stout, deep species, with shorter spines; dorsal region elevated; the profile concave. Mississippi Valley.

** Eye large, median, the middle of the head falling before its posterior margin; anal short, not greatly elongate, its rays 25 to 29.

3. ***I. punctatus***, (Raf.) Jor. COMMON CHANNEL CAT. BLUE CAT. WHITE CAT, etc. Head moderate, about 4

in length; dorsal region not especially elevated; spines long; coloration of the others, bluish silvery, young spotted with olive. New York to South Carolina, West to the Rocky Mountains and Mexico, very abundant. It has been described under some twenty-three different specific names. [*I. cærulescens*, (Raf.) Gill.]

2. ***AMIURUS,*** Rafinesque. CAT FISHES.

* Caudal fin forked, its lower lobe the larger; upper jaw longest; colors more or less olivaceous or silvery.

† Anal fin elongate, of 23 to 28 rays.

a. Head rather broad; anal rays 25 or 26.

1. ***A. nigricans,*** (LeS.) Gill. GREAT FORK-TAILED CAT. CAT FISH OF THE LAKES. MISSISSIPPI CAT, FLORIDA CAT. GREAT BLUE CAT. Head comparatively small, $4\frac{1}{4}$ in length, its width 5; barbels long; spines short and stout, serrated; body rather low and moderately stout; colors dark, mottled with paler; size very large. Great Lakes, Mississippi Valley and South to Florida, much the largest of our cat fishes, reaching a weight of 100 to 200 lbs.

aa. Head narrow, decidedly longer than broad

† Anal rays 23 or 24.

2. ***A. lupus,*** (Grd.) Gthr. Caudal fin deeply furcate; head narrow, longer than broad; anal rays 23 or 24; pectoral spines long and slender, dentate; barbels long; depth about 5 in length; body rather slender; head narrowed, its width $4\frac{3}{4}$ in length, being less than its length above; distance from snout to dorsal spine $1\frac{1}{3}$ to $1\frac{1}{4}$ in distance from dorsal spine to adipose fin; base of anal as long as head. The species strongly resembles the species of *Ichthælurus*, and is almost intermediate between the two genera, the supraoccipital bone being

almost connected with the inter-spinal. Southwestern States.

3. ***A. niveiventris,*** Cope. Similar, but the head broader, its width equal to its length above; distance to dorsal spine $1\frac{1}{6}$ in distance from spine to adipose fin; base of anal notably less than head. Neuse River, N. C.

†† Anal fin short, of 19 to 22 rays.

4. ***A. albidus,*** (LeS.) Gill. WHITE CAT. CHANNEL CAT OF THE POTOMAC. Head narrowed, very wide in adults, quite narrow in young, its width 4 to 5 in length of body; upper jaw considerably the longer; dorsal spine nearer adipose fin than snout; caudal deeply forked; base of anal fin $4\frac{1}{2}$ in length; A. 21. Pennsylvania to South Carolina, abundant. [*A. lynx*, (Grd.) Gill.]

5. ***A. lophius,*** Cope. BIG-MOUTHED CAT. Head extremely wide, its width $3\frac{3}{4}$ in length, as great as the length of the head; upper jaw slightly the longer; caudal shallow-forked; base of anal fin 6 in length; A. 21; color silvery as in the preceding. Tributaries of Chesapeake Bay, rather common. Very old specimens of *A. albidus* resemble *A. lophius*, but may be recognized by the characters above noted. *A. lophius* has the largest mouth of any North American Cat Fish.

** Caudal fin rounded or slightly emarginate, usually truncate when spread open.

‡ Anal fin very long, its base one-fourth or more the length of the body; of 24 to 27 rays.

b. Head and body elongate; mouth narrow.

6. ***A. erebennus,*** Jordan. GOODE'S CAT. Head and body elongated; the dorsal region considerably elevated; the head quite long and narrowed forwards; much longer than broad; its width in front of eye only about half its length; mouth rather narrow, with equal jaws; barbels

long; adipose fin large; spines strong; dorsal fin very high; anal fin long and deep; caudal fin short; color dark; gill openings narrow. Southeastern streams; resembling *A. nigricans*, but with the caudal fin of *A. natalis*.

bb. Head broad; mouth wide; form stout.

7. ***A. natalis,*** (LeS.) Gill. YELLOW CAT. CHUBBY CAT. Body stout and heavy, with large head; dorsal spine nearer snout than adipose fin; a widely diffused species running into many varieties. The following are some of the principal ones:

Var. ***natalis,*** (LeS.) Body very short and obese, with short, deep, fleshy caudal peduncle, and short caudal fin, on which the flesh encroaches. This may be simply a peculiar state of individuals rather than a distinct variety.

Var. ***lividus,*** (Raf.) Jor. More elongate, dark colored; the jaws equal. Western and Southern streams, common. (*A. catus* of authors.)

Var. ***cupreus,*** (Raf.) Jor. Similar, but yellowish brown, and with the upper jaw decidedly the longer; generally abundant.

Var. ***cœnosus,*** (Rich.) Jor. Like *cupreus*, but greenish or black in color. Great Lakes.

Var. ***analis,*** Jor. Anal fin very large, of 27 rays, its base nearly $\frac{1}{3}$ length of body. S. W.

‡‡ Anal fin moderate, of 18 to 22 rays.

c. Lower jaw distinctly longer than upper.

8. ***A. vulgaris,*** (Thompson) Nelson. LONG-JAWED CAT. Body rather elongate, the depth $4\frac{1}{2}$ to 5 in length; head $3\frac{1}{2}$; barbels long; mouth wide; head longer than broad; dorsal nearer snout than adipose fin; head broad forwards; A. 20· dark reddish brown, varying to black·

ish. Great Lakes and tributaries, generally abundant. [*A. dekayi*, (Grd.) Gill.]

Var. **œlurus,** (Grd.) Jor. Has the head somewhat narrowed forwards, the dorsal region more elevated, and its spine about midway of the body. Upper Mississippi River.

cc. Jaws about equal, or the upper evidently the longer.

d. Eyes well developed.

e. Body not notably elongate.

f. Head moderately broad; a nearly even slope from the tip of the snout to the elevated base of the dorsal.

9. ***A. catus,*** (L.) Gill. BULL-HEAD. HORN POUT. SMALL CAT FISH. Body rather elongate, depth 4 to 4½ in length; head broader than in the next, the front less steep, but its slope more uniform; body less rapidly narrowed behind; anal fin longer, its base 4½ in body, the rays 21 or 22 in number; upper jaw distinctly the longer; color dark yellowish brown, varying to blackish, sometimes marbled, the young often quite black. Great Lakes to Maine and South Carolina, the common Eastern species. (*A. atrarius*, *nebulosus*, *hoyi*, etc., of authors.)

10. ***A. marmoratus,*** (Holbr.) Jor. MARBLED CAT. Body sharply mottled with brown, greenish and whitish; the coloration therefore singular among Cat Fishes; jaws equal or nearly so; depth about 4 in length; slope of profile very steep; dorsal fin high; the spine more than half length of head; dorsal spine nearer adipose fin than snout; barbels long; branchiostegals 10; head 3¼ in length. South Atlantic States to Illinois.

11. ***A. melas,*** (Raf.) Jordan & Copeland. BLACK CAT. Body very stout, short and deep, the depth 3½ to 4¼ in length; head not very broad, rather contracted

forwards, the front steeply elevated, the body thick across the "shoulders," rather rapidly narrowed behind; anal fin short and deep, of 18 or 20 rays, its base nearly five in length, the color of the rays forming a sharp contrast with that of the membranes; upper jaw scarcely longest; size small; color almost black. Mississippi Valley, abundant. (*A. catulus*, *obesus*, *confinis*, etc., of authors.)

ff. Head very broad, the slope from snout to base of dorsal quite uneven, there being a more or less decided angle at the occiput.

12. ***A. xanthocephalus,*** (Raf.) Gill. Yellow-Headed Cat. Head about as broad as long, its length 4 in that of body; dorsal nearer adipose fin than snout; anal fin short, its base less than one-fifth the length of the body, its rays usually 19; body stout and short; mouth very broad; colors pale, chiefly yellowish; size small. Ohio Valley, abundant; resembles *A. natalis cupreus*, but has a much smaller anal.

ee. Body very elongate, slender, the head flattish and broad above.

13. ***A. platycephalus,*** (Grd.) Gill. Flat-Headed Cat. Form slender, elongate, approaching that of *Pelodichthys*, the depth being 4 to 6 times in length of body; head broad and flat, nearly as wide as long; anal fin with 20 to 22 rays; the base of the fin 4½ to 5 in body; jaws equal; branchiostegals 11; mouth very wide; dorsal spine nearer snout than adipose fin; coloration somewhat marmorate; a blackish horizontal bar at base of dorsal. Southern Rivers; approaches *A. brunneus*, but less elongate, and with a different mouth.

dd. Eyes rudimentary, concealed under the skin; blind cave species. (*Gronias*, Cope.)

14. ***A. nigrilabris,*** (Cope) Gill & Jor. Cave Cat Fish.

Form, etc., nearly of *Amiurus melas;* but the eyes little developed; anal short, of about 19 rays. Subterranean stream, tributary of Conestoga River, E. Penn.

‡‡‡ Anal fin small, 15 to 17 rayed.

g. Body short and stout.

15. ***A. pullus,*** (DeKay) Gill. Black Bull-Head. Depth 4 in length; the head flattened, nearly as broad as long; mouth large; dorsal nearer adipose fin than snout; A. 16 or 17; color black, white below; size small. W. N. Y. to New England.

gg. Body comparatively slender and eel-like.

16. ***A. brunneus,*** Jordan. Green Cat. Body very slender, elongate, the depth about 5½ in length; head broad and flat, about 4 in length, the width 4½; the upper jaw more projecting than in any other of the species known; profile convex, not steep; dorsal fin very high, ⅔ length of head, well forward, its spine nearer snout than adipose fin; anal fin short and high, its base 5 in length of body, its rays 16 to 18; pectoral spine serrated; color pale olive-green; a blackish horizontal bar at base of dorsal. The slenderest of the *Amiuri*, abundant in many Southern streams.

3. PELODICHTHYS, Rafinesque. Mud Cats.

(*Hopladelus*, Raf.)

1. ***P. olivaris,*** (Raf.) Gill & Jordan. Mud Cat. Body very long and slender, much depressed forwards, closely compressed behind; head very long and flat, tapering downwards and forwards, broadly rounded in front; head 3½ in length, depth 6 in length; dorsal spine somewhat enveloped in thick skin; pectoral spine very long, flattened, serrated behind; adipose fin high and long; jaws thin and flat the lower always the longer; colors

much mottled; anal fin quite short, of 15 rays. A singular species, reaching a very large size, abounding on the bottoms of our larger Western and Southern rivers.

4. NOTURUS, Rafinesque. Stone Cats.

* Intermaxillary band of teeth with strong lateral backward processes, as in *Pelodichthys*. (*Noturus.*)

1. **N. flavus,** Raf. Yellow Stone Cat. Head much depressed and flattened, little longer than broad; barbels rather short; head 4¼ in length; depth 5⅔; distance from snout to dorsal 3; middle of body cylindrical, somewhat carinate above; adipose fin notched; spine of pectorals roughish behind, slightly retrorse-serrate in front. St. Lawrence to Kentucky and Upper Missouri, abundant, the largest species, reaching a length of a foot.

** Intermaxillary band of teeth without lateral backward process. (*Schilbeodes*, Bleeker.)

† Pectoral spines more or less serrate on the inner edge; adipose fin notched.

a. Pectoral spines rather small, their internal serræ feeble, less than half the diameter of the spine; anal rather long, of more than 14 rays.

2. **N. insignis,** (Rich.) Gill & Jor. Margined Stone Cat. Upper jaw decidedly longest; pectoral spine about half length of head, pretty strongly retrorse-serrate externally, dorsal spine much nearer anal than snout, the distance from snout to dorsal more than one-third the length; anal fin with 16 to 19 rays; body elongate; head flattened; dusky, a distinct black margin to dorsal and caudal fins; size rather large; Pennsylvania to S. Carolina, abundant. [*N. lemniscatus*, (Val.) Grd. *N. marginatus*, Baird.]

3. **N. exilis,** Nelson. Slender Stone Cat. A sort of "starved" representative of the preceding, smaller

and slenderer, with smaller fins; pectoral spine about one-third the length of the head; *jaws almost equal;* dorsal spine nearer snout than anal; distance from snout to dorsal less than one-third of length; anal rays 15; color brownish, with some darker mottlings; tip of dorsal black. Illinois to Kansas.

aa. Pectoral spines very strong, curved, their internal serræ very strong, spine-like, more than half the diameter of the spine; coloration variegated; a series of definite black blotches on the back; anal rays less than 14.

4. **N. miurus,** Jordan. Saw-Spined Stone Cat. Body moderately but not greatly elongate, the dorsal region more or less elevated; adipose fin continuous, high, interrupted by a notch which does *not* break the continuity of the fin, the rudimentary caudal rays beginning in the notch; color grayish, with four definite broad dorsal cross-bars; one before the dorsal, one behind it; one on middle of adipose fin and one small one behind it; top of head and tips of fins black; A. 13. Ohio to Iowa and Louisiana, abundant, readily known by its coloration and its long, rough spines.

5. **N. eleutherus,** Jordan. Free-Finned Stone Cat. Similar but larger and rather stouter; the adipose fin *divided to its very base*, so that a space greater than the diameter of the eye intervenes between the adipose fin and the rudimentary rays of the caudal; anal 11 to 13; colors much as in *N. miurus.* French Broad River and Tar River, N. C.

†† Pectoral spines grooved on the inner edge, not serrated; adipose fin high and continuous.

b. Pectoral spine very short and small, less than one-fourth the length of the head; head very small and narrow.

6. **N. leptacanthus,** Jor. Small-Spined Stone Cat. A small, slender species, with very feeble spines, found in the Alabama and other Southern Rivers.

bb. Pectoral spines long and strong, entire without, grooved within, about half the length of the head; color pale yellowish brown, with dark streaks along the sides.

7. ***N. gyrinus,*** (Mit.) Raf. TADPOLE STONE CAT. A "starved" representative of the next, slimmer in every way; head shorter and smaller; body more elongate, and more compressed, almost ribbon-shaped behind; barbels pale; anal 13. S. E. N. Y., and Eastern Penn. and N. J.

8. ***N. sialis,*** Jordan. CHUBBY STONE CAT. The shortest and stoutest of all the species; head short and very broad, nearly 4 in length; its width about the same; depth $4\frac{1}{2}$ to $5\frac{1}{2}$; barbels dark; yellowish, a black lateral streak and usually three dorsal ones. Ohio to Kansas, N. to British America, abundant.

ORDER BB.—APODES.

(The Eels.)

Maxillary bones rudimentary; body serpentiform; no ventral fins; scapular arch free from skull; scales small or wanting.

FAMILY CXI.—ANGUILLIDÆ.

(The Eels.)

Body much elongated, nearly cylindrical, covered with small scales; vent posterior; pectorals present; vertical fins confluent; sides of upper jaw formed by the maxillaries; intermaxillaries more or less coalescent with the vomer; stomach cœcal. Genera two or three; "an infinite number of species have been described" (*Günther*), but the actual number can not exceed forty. In seas and sluggish fresh waters of all regions.

1. **ANGUILLA,** Thunberg. EELS.

1. ***A. rostrata,*** (LeS.) DeK. COMMON AMERICAN EEL. Distance between dorsal and anal shorter than head. U. S., chiefly coastwise, but ascending all rivers and introduced into the Great Lakes. (*A. bostoniensis*, etc., of authors.) But one species is recognizable in the Northern Hemisphere, according to a recent French writer, M. Dareste, who unites our species with the European *A. vulgaris.*

Sub-Class Ganoidei.

(*The Ganoid Fishes.*)

Skeleton bony or cartilaginous; tail more or less heterocercal; optic nerves forming a chiasma; arterial bulb rhythmically contractile, provided with several rows of valves; air bladder frequently cellular and lung-like; skin usually with bony plates; intestine usually with a spiral valve; ventral fins, if present, abdominal. Of this important sub-class but few species are now existing, and these few vary widely from one another. Of the earlier fossil fishes, a very large proportion are Ganoids.

ORDER CC.—CYCLOGANOIDEI.

(*The Cycloganoids.*)

This order contains but a single species among recent fishes.

FAMILY CXII.—AMIIDÆ.

(*The Bow-Fins.*)

Body oblong, rather stout, covered with thick cycloid scales; tail heterocercal, the caudal peduncle curved upwards behind, "like a sled-runner;" a large bony buckler between branches of lower jaw; membrane bones of head much developed, very hard; jaws broad, with strong teeth in two sets, similar teeth on vomer, palate and pterygoids; snout short, rounded; ventrals large, abdominal; dorsal very long, the rays of nearly uniform height; anal short and rather high; air bladder large, cellular, lung-like, communicating by a glottis with the œsophagus; stomach large.

A single species is found in the larger bodies of fresh water in the U. S. from N. Y. to the plains. It is exceedingly tenacious of life, even more so than the species of *Amiurus*. The flesh is soft and pasty, and not edible. In some regions its voracity has acquired for it the name of "Lawyer," because, as has been said, "it will bite at any thing, and is good for nothing when caught."

1. ***AMIA,*** Linnæus. GRINDLES.

1. ***A. calva,*** L. BOWFIN. DOG FISH. MUD FISH. Depth 4 to 4½ in length; head nearly 4; eye 8 in head; anterior nostrils each with a short barbel; dark olive or blackish above, nearly white below; sides with traces of greenish markings; lower jaw and gular plate with round blackish spots; fins mostly dark; ♂ reaching a length of 18 inches, with a roundish black spot on the upper base of caudal, which is surrounded by an orange or yellowish shade; ♀ larger, 2 feet or more in length, without the black caudal spot; D. 42 to 53; A. 10 to 13; lat. l. 65 to 70. E. U. S.; abundant in the Great Lakes. (*A. ornata*, *reticulata*, and *viridis*, LeS. *A. marmorata*, *canina*, *lentiginosa*, *cinerea*, and *subcærulea*, Val. *A. ocellicauda*, Rich. *A. occidentalis*, DeK. *A. thompsoni* and *piquotii*, Duméril.)

ORDER DD.—RHOMBOGANOIDEI.

(*The Rhomboganoids.*)

This order includes, among recent fishes, only the following family:

FAMILY CXIII.—LEPIDOSTEIDÆ.

(*The Gar Pikes.*)

Body elongated, sub-cylindrical, covered with hard, enamelled, lozenge-shaped, ganoid plates; snout elongated, spatulate, or beak-like; upper jaw of several pieces, longer than the lower, which is formed of as many parts as in Reptiles; both jaws and palate armed with bands of rasp-like teeth, and series of larger, conical ones; fins with fulcra (elongated modified scales) in front; dorsal and anal short and placed far back, moderately high; vertebræ concavo-convex, with ball and socket joints as in Reptiles; air bladder cellular, like the lungs of Reptiles, connected with the pharynx; stomach not cœcal but with numerous pyloric appendages; intestine with rudimentary spiral valve; no spiracles; branchiostegals three; pseudobranchiæ present. Fresh waters of N. A., from New England to the Rocky Mountains, S. to Central America and Cuba. Genera two or three (*Cylindrosteus* seems to us to be rather a sub-genus of *Lepidosteus*); species probably about five although forty have been described; until some more tangible distinctions are shown, we can admit but three.*

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* In a recent work on these fishes, Prof. August Dumeril very laboriously distinguishes the following "species" among the specimens of *Lepidosteus* in the Museum at Paris:

L. osseus, (L.) (= *L. gavialis*, Lac.); *L. louisianensis*, Dum. (= *L. oxyurus*, Raf. = *Sarchirus vittatus*, Raf.); *L. harlani*, *L. ayresi*, *L. smithii*, *L. copei*, *L. lamarii*, *L. clintonii*, *L. troostii*, *L. piquotianus*, *L. lesueurii*, *L. elizabeth*, *L. thompsoni*. *L. horatii*, *L. milberti*, *L. treculii*, Dumeril; and *L. huronensis*, Rich. Of *Cylindrosteus*, he finds *C. platystomus* (Raf.); *C. productus* (Cope); *C. platyrhynchus* (DeK.); *C. agassizii*, *C. rafinesquei*, *C. bartoni*, *C. castelnaudii* and *C. zadocki*, Dum.

Most of these nominal species are based upon the most trifling individual differences, and often the right side of a specimen indicates one "species," and the left another. As matters stand, we have no alternative but to reject them all, and to wait for the time when systematic writers shall be wiser or more honest.

* Large teeth on the maxillaries in a single row; species of moderate size, 2 to 5 feet long. . . LEPIDOSTEUS, 1.

** Large teeth on the maxillaries in two rows; snout broad, depressed, about equal to rest of head; size large, length 5 to 10 feet. . . . . . LITHOLEPIS, 2.

1. *LEPIDOSTEUS,* Lacépède. GAR PIKES.

Sarchirus, Raf. (Young with the pectoral fins fleshy.)

* Snout very slender, much longer than the rest of the head. (*Lepidosteus.*)

1. ***L. osseus,*** (L.) Ag. GAR PIKE. BONY GAR. BILL FISH. Head nearly 3 in length; depth nearly 12; snout more than twice the length of rest of head; eye nearly 2½ in distance to margin of preopercle, more than 2 in interorbital space; ventrals midway between pectorals and anal; olivaceous, white below; sides with obscure spots, more evident posteriorly; vertical fins with distinct round black spots; D. 7; A. 9; lat. line 64 to 66; length 2 to 5 feet. N. Y. to the plains and South, abundant in large bodies of water.

* Snout shortened, rather broad, about as long as the rest of the head. (*Cylindrosteus*, Raf.)

2. ***L. platystomus,*** Raf. SHORT-NOSED GAR PIKE. Depth 7 to 8 in length; head 3½; eye 10 in head, three times nearer opercular margin than end of snout; ventrals much nearer P. than A.; length of head notably shorter than from P. to V.; olivaceous, sides and fins spotted with black; D. 7; A. 8; lat. l. 60 to 65. Great Lakes and streams S. and W. of N. Y. to Rocky Mountains.

2. *LITHOLEPIS,* Rafinesque. ALLIGATOR GARS.

= *Atractosteus*, Raf.

1. ***L. spatula,*** (Lac.) Jor. GREAT GAR. ALLIGATOR GAR.

Diamond Fish. Snout broad, depressed, the length of the cleft of the mouth being about half the length of the head; color olivaceous; head 3½ in length; D. 8; A. 8; lat. l. 60; very large, reaching a length of 8 feet or more. Mississippi Valley, N. to Illinois and Ohio, abundant southward. (*A. ferox*, Raf. *L. adamantinus* Raf.)

ORDER EE.—SELACHOSTOMI.

(The Spoon-Bills.)

This order contains but the single family *Polyodontidæ.*

FAMILY CXIV.—POLYODONTIDÆ.

(The Spoon-Billed Cats.)

Body elongated; skin naked, with minute stellated roughnesses, and some bony plates about head and tail; mouth very wide, not inferior, but overhung by the long snout; minute teeth on lower jaw, maxillaries and palate, teeth sometimes deciduous with age; snout produced into a very long and spatula-like process, thin and flexible at its edges; no barbels; caudal with fulcra, as in *Lepidosteus*, heterocercal, the lower lobe well developed; opercle with a long flap reaching to pectorals or beyond, and sometimes to ventrals; spiracles present; no tongue; one broad branchiostegal; air bladder large, communicating with the œsophagus; intestine with a well-developed spiral valve; stomach cœcal, with a broad divided pyloric appendage. Fresh waters of U. S. and China. Species two; *P. folium* from the Mississippi, and *P. gladius* from the Yangtsekiang.

1. POLYODON, Lacépède. DUCK-BILLED CATS.

= *Spatularia*, Shaw.
= *Planirostra*, LeSueur.

1. ***P. folium,*** Lacepede. DUCK-BILLED CAT. SPOON-BILLED STURGEON. Snout nearly $\frac{1}{3}$ of length; opercular flap reaching much beyond pectorals; fins all more or less falcate; color gray; D. 55 to 60; A. 56; length 5 feet or more. Mississippi and its larger tributaries, abundant. A singular fish, bearing considerable resemblance to a Shark.

ORDER FF.—CHONDROSTEI.

(The Cartilaginous Ganoids.)

This order is equivalent to the family *Acipenseridæ.*

FAMILY CXV.—ACIPENSERIDÆ.

(The Sturgeons.)

Body elongate, sub-cylindrical, with five longitudinal rows of bony shields, the lower sometimes deciduous; snout produced; mouth entirely inferior, transverse, protractile, toothless; four barbels in a row under snout in front of mouth; vertical fins with fulcra; caudal heterocercal; dorsal and anal far back. No branchiostegals; air bladder large, not cellular; stomach not cœcal, with pyloric appendages; intestines with spiral valve. Distribution same as that of *Salmo.* Fresh waters of northern regions, some species marine and entering rivers. Genera two; species twenty (*Günther*), eighty or more (*August Duméril*). Perhaps in no group has the making of nominal species been carried to a greater extent than in this.

* Rows of bony bucklers distinct throughout; spiracles present; snout rather narrow, sub-conical. . . ACIPENSER, 1.

** Rows of bony bucklers confluent behind, entirely surrounding the depressed tail; no spiracles; snout flattened, rather broad, shovel-shaped. . . . . SCAPHIRHYNCHOPS, 2.

1. ACIPENSER, Linnæus. STURGEONS.

* Marine species ascending rivers; lateral shields 22 to 32.

1. ***A. sturio,*** L. COMMON SEA STURGEON. SHARP-NOSED STURGEON. Snout pointed, half the length of head; dorsal shields 11 to 13; lateral shields 26 to 31; D. 37 to 44 rays. Atlantic Ocean S. to Africa and West Indies. (*A. oxyrhynchus*, Mit., the American form.)

2. ***A. brevirostris,*** LeSueur. BLUNT-NOSED STURGEON. Snout blunt, one-quarter length of head; dorsal shields 8 to 10; lateral shields 22 to 28; abdominal 8 to 10; D. 30 rays; skin with minute scattered prickles and stellate ossifications. Cape Cod to Fla.

** Species of fresh water; lateral shields 33 to 38.

3. ***A. maculosus,*** LeSueur. ROCK STURGEON. BONY STURGEON. Snout pointed, nearly as long as rest of head; head $3\frac{1}{3}$ in length of body; bony shields large, close together, 13 to 16 in front of dorsal, 33 to 38 on sides, 9 or 10 on abdomen, all of them rough and strongly radiated, with more or less hooked or incurved tips; skin rough; D. 37 to 45. Great Lakes (?), Ohio R. and southward.

4. ***A. rubicundus,*** LeSueur. RED STURGEON. LAKE STURGEON. Head $4\frac{1}{2}$ in length; eye 10 in head, nearly midway; dorsal scutes 16 (to base of D), relatively small and rather distant; lateral scutes 35; ventral scutes 9; snout rather blunt, becoming more so with age, rather shorter than rest of head; barbels nearer to end of snout

than to eye; scutes relatively smaller, smoother and less crowded than in the preceding; blackish, sides paler or reddish; length 2 to 6 feet; D. 37. Great Lakes and Western Rivers.

2. **SCAPHIRHYNCHOPS,** Gill. SHOVEL-NOSED STURGEONS.

= *Scaphirhynchus*, Heckel (preoccupied in Birds).

1. ***S. platyrhynchus,*** (Raf.) Gill. SHOVEL-NOSED STURGEON. Tail wider than deep, extending beyond caudal rays and ending in a filament; snout nearly the form of a spade; whole body rough with small prickles; dorsal shields 15 or 16; lateral shields 40 to 46; abdominal 10 to 13; all the shields rough and strongly carinated, the keel ending behind in a spine which points backward; size large. Mississippi Valley.

Class VII. — Marsipobranchii.

(*The Lampreys.*)

Skeleton cartilaginous, without ribs, limbs, shoulder girdle nor pelvic elements; skull imperfectly developed, without true jaws; a single median nostril; gills in the form of fixed sacs, without branchial arches; gill sacs typically seven on each side; mouth nearly circular, suctorial; no scales; body elongated, eel-shaped; alimentary canal nearly straight and simple; no arterial bulb.

(Class VI. — ELASMOBRANCHII, the *Selachians*, represented on our Atlantic Coast by many species of Sharks and Skates, is here omitted, as its members are exclusively marine, and it does not therefore come within the scope of this treatise. Class VIII. — LEPTOCARDII, the *Lancelets*, is also omitted for the same reason. The latter class contains, as far as now known, but two genera, *Epigonopterus* and *Amphioxus*, with two or three species. One of these, *Amphioxus caribæus*, Sundevall, occurs along the coast of our South Atlantic States.)

ORDERS OF MARSIPOBRANCHII.

* Nasal duct a blind sac, not penetrating the palate. HYPEROARTIA, GG.

** Nasal duct penetrating the palate. HYPEROTRETA, page 347

GG. FAMILIES OF HYPEROARTIA.

* Branchial sacs seven on each side · intestine with spiral valve. PETROMYZONTIDÆ, 116.

FAMILIES OF HYPEROTRETA.

* One external aperture on each side of body, leading by six ducts to as many branchial sacs; no spiral valve; marine parasites, burrowing into the bodies of other fishes. *Myxinidæ*, the *Hag Fishes.*

ORDER GG.—HYPEROARTIA.

(*The Lampreys.*)

FAMILY CXVI.—PETROMYZONTIDÆ.

(*The Lampreys.*)

Body eel-shaped, naked; dorsal and anal fins long and low, usually continuous with the caudal; mouth suctorial, armed with horny teeth which rest on papillæ. Eggs small.

These animals undergo a metamorphosis; the young are usually toothless, and have the eyes rudimentary. Genera five or six, in temperate regions, found in all waters. They attach themselves to fishes and other animals, and feed by scraping off the flesh, by means of their rasp-like teeth.

The American species are still very imperfectly known. Until quite recently the *larvæ* were considered as forming distinct genera, which have been termed *Ammocœtes*, *Scolecosoma*, *Chilopterus*, etc.

* Maxillary teeth close together, not forming a crescentic plate.
  † Dorsals well separated. . . . PETROMYZON, 1.
  †† Dorsals connected. . . . . ICHTHYOMYZON, 2.
** Maxillary tooth forming a crescentic plate, with a cusp at each end; dorsal continuous. . . . . AMMOCŒTES, 3.

1. *PETROMYZON,* Linnæus. LAMPREYS.

1. ***P. marinus,*** L. GREAT SEA LAMPREY. Resembles the next, but larger, with a shorter head, which is but little longer than the "chest" (space occupied by the branchial openings); color olive brown, mottled with black; L. 30 to 40. Marine, ascending rivers, eastward. (*P. americanus*, LeS.)

2. ***P. nigricans,*** L. Large Black Lamprey. Head very large, longer than the "chest," 6½ in length; depth about 13; body little compressed; dorsal fins rather low, distinctly separated; eyes and mouth very large; a depression between eyes and snout; a single bicuspid tooth in front of œsophagus; mandibulary plate curved, with about eight pointed teeth; rest of mouth covered with rather large teeth disposed in oblique cross-rows, five or more in each row; lips fringed; L. 12. Lakes and streams, Cayuga L., N. Y. (*Wilder*), and E.; properly a marine species. Also in Europe. (*P. nigricans*, LeS., the American form.) (Several other Lampreys have been described from our Eastern streams and coast, but they are very doubtful.)

2. ICHTHYOMYZON, Girard. Lamperns.

1. ***I. argenteum,*** (Kirt.) Gir. Silvery Lamprey. Head quite small, shorter than "chest," about 10 in length; depth nearly the same, in adult; body stout, compressed; dorsal fin very high, with a shallow depression; eyes distinct in adult, concealed in young; mouth small, with inconspicuous teeth; color ashy silvery, with numerous small black dots; larger ones above the gill openings; L. 12. Great Lakes and Ohio Valley, E. to N. Y., frequent. (*Ammocœtes concolor*, Kirt., *A. œpyptera*, Abbott.)

3. AMMOCŒTES. Dumeril Lamperns.

1. ***A. niger,*** (Raf.) Jor. Small Black Lamprey. Head moderate, longer than "chest," 8⅓ in total length; depth 14; body scarcely compressed except behind; dorsal fins rather high, slightly connected; eyes large; mouth rather small, one tooth with two cusps well apart

in front of œsophagus; mandibulary plate nearly straight, with about eight sub-equal teeth; a few scattering teeth on sides of mouth; snout rounded; dark blue black, unspotted, silvery below; L. 8 to 11. Great Lakes, Upper Miss. and Ohio Valley, abundant in many localities, ascending small brooks in the spring.

ADDENDA.

To page 16, after *Canis lupus:*

2. ***C. latrans,*** Say. Coyote. Prairie Wolf. This common species of the Western plains is said still to occur occasionally in Wisconsin. It is much smaller in size than *C. lupus.*

To page 19, after Mephitis mephitica:

Subgenus *Spilogale*, Gray.

2. ***M. putorius,*** (L.) Coues. Little Striped Skunk. Black, with white patch on forehead; four parallel dorsal stripes, broken behind; tail black, with white pencil at tip. Size very small. L. 11; T. 7½. Southwestern, said to have occurred in Wisconsin. (*Hoy.*)

On page 26, for the analysis of genera, substitute:

* Ears ordinary; feet fimbriate; tail at least as long as head and body; teeth $32 \div \frac{20}{12}$. . . . . . . Neosorex, 1.

** Ears ordinary; feet not fimbriate; tail shorter than head and body. . . . . Sorex, 2.

*** Ears small, the parts directed forwards, so as to show no opening and no external ear whatever; feet ordinary; tail about as long as head. . . . . . . Blarina.

1. ***NEOSOREX,*** Baird. Water Shrews.

1. ***N. palustris,*** (Rich.) Coues. Back hoary black; belly ashy gray; largest of our shrews; L. 6; T. 2½. British America, S. to N. H. and Mass.

2. ***SOREX,*** Linnæus. SHREWS.

* Teeth colored, 32—$\frac{2\,0}{1\,2}$. (*Sorex.*)

1. ***S. forsteri,*** Rich. Ears small; tail ⅔ length of head and body; snout slender; L. 4½; T. 1⅔. N. U. S.

2. ***S. richardsoni,*** Bach. Ears rather small; tail scant-haired; L. 4; T. 1¼. Wis. and N.

3. ***S. platyrhinus,*** (DeK.) Wagn. COMMON SHREW. Ears very large for a Shrew; tail scant-haired; color chestnutty; L. 3¾; T. 1½. N. U. S.

4. ***S. cooperi,*** Bach. Ears large; chestnut brown; L. 3¾; T. 1½. N. U. S.

5. ***S. personatus,*** Geoff. St. Hilaire. Ears large; chestnut brown; L. 2¾; T. 1; smallest of our Shrews. Penn. and S.

** Teeth 30—$\frac{1\,8}{1\,2}$. (*Microsorex*, Baird.)

6. ***S. hoyi,*** Baird. HOY'S SHREW. Very small and slender; ears large; olive brown; L. 3; T. 1¼. Northern States. (*S. thompsoni*, Bd.)

3. ***BLARINA,*** Gray. SHORT-TAILED SHREWS.

* Teeth 32—$\frac{2\,0}{1\,2}$. (*Blarina.*)

1. ***B. brevicauda,*** (Say) Baird. SHORT-TAILED SHREW. Size large for a Shrew; fur short and coarse; color dark ashy gray; L. 4½; T. 1. E. U. S., common. [*B. talpoides* (Gapper) Baird.]

2. ***B. carolinensis,*** (Bach.) Bd. Smaller; leaden gray; L. 3¼; T. ¾. U. S., chiefly southward.

3. ***B. angusticeps,*** Baird. Intermediate; skull usually narrow; uniform plumbeous. L. 3½; T. 1. New England.

** Teeth 30—$\frac{1\,8}{1\,2}$. (*Soriciscus*, Coues.)

4. **B. parva,** (Say). Body stout; iron gray, with brown gloss; L. 3¼; T. ¾. Southern States, N. to Penn. [*B. cinerea* (Bach.) Bd.]

5. **B. exilipes,** Baird. Small, fur full; feet very small; hoary olive; L. 2½; T. ⅔. Southern States, N. to Ills. The number of species of *Blarina* and *Sorex* is still uncertain, and their geographical distribution has been little studied.

To page 28, after *Tamias striatus:*

2. **T. quadrivittatus,** (Say) Wagner. MISSOURI CHIPMUNK. Smaller; inter-spaces between the stripes all whitish (in *T. striatus*, the upper interspaces are colored like the back); L. 8; T. 4. Wisconsin (*Hoy*) and Northwestward.

To page 61, after *Helminthophila pinus*, add:

2. (b) **H. lawrencii,** Herrick. LAWRENCE'S WARBLER. Olive green above; wings bluish gray, with two white bands; crown and under parts orange; a broad black patch from bill through and beyond eye; chin, throat and fore part of breast black, these patches separated from the loral patch by a yellow stripe; L. 4½; W. 2½; T. 2. New Jersey, two specimens known.

2. (c) **H. leucobronchialis,** Brewster. WHITE-THROATED WARBLER. Crown bright yellow; wing coverts chiefly yellow; superciliary line, cheeks and entire under parts silky-white, the breast tinged with yellow; nape ashy; upper surface otherwise olive; a narrow stripe of black from base of bill through and behind eye; no traces of black on cheeks or throat; L. 5½; W. 2½; T. 1¾. Massachusetts, one specimen known.

To page 77, after *Lanius borealis:*

2. ***L. ludovicianus,*** (L.) LOGGERHEAD SHRIKE. Slate-colored above, the rump scarcely paler; black head stripe *not* bordered above by hoary; L. 8¼; W. 4; T. 4½. Southern States, up to Illinois, etc.

To page 83, after *Calcarius pictus :*

*** Bill very large, turgid, without ruff; hind claw straight but short. (*Rhynchophanes*, Kaup.)

4. ***P. maccownii,*** Lawr. MACCOWN'S BUNTING. Crown and pectoral crescent black; bend of wing chestnut; superciliary line and under parts white; back streaked; outer tail feathers white, inner partly white, the white areas being cut squarely off; L. 6¼; W. 3¾; T. 2½; B. nearly ½. Plains, chiefly northward, E. to Illinois. (*Nelson.*)

To page 88, after *Junco hyemalis:*

2. ***J. oregonus,*** (Towns.) Scl. OREGON SNOW-BIRD. Head, neck and breast black; back and wings with reddish brown, belly white, sides brownish tinged; ♂ duller; L. 6½; W. 3; T. 3. Rocky Mts. to Pacific Coast, straying East to Illinois. (*Nelson.*)

On page 105, line 5, add to the common names of *C. auratus*, the name " *Yellow Hammer.*"

On page 108:

In *Otus brachyotus*, occasionally but one primary is emarginate; the species however differs strikingly in color from *O. vulgaris*, the under parts especially being less variegated. Mr. Ridgway informs me that the genus *Asio*, *Brisson*, should probably stand instead of *Otus*. Our species would then be called *Asio otus* and *Asio brachyotus*.

On page 188, after *R. palustris*, add:

2. (b) ***R. areolata,*** B. & G. HOOSIER FROG. Head broad; body, head and sides with the ground color largely predominating, and with narrow rings of a greenish slate color, which become larger and more irregular posteriorly; hind legs black, crossed with irregular lines of yellowish slate color; fore limbs similarly marmorate; tympanum black with pale ring; below chiefly yellowish white; toes very long; size medium; L. 3½. Benton Co., Indiana, lately discovered by Mr. E. F. Shipman, South to Texas. (*Rana circulosa.* Rice & Davis. Ed. 3.)

On page 271:

Genus **SALMO.**

Since the part of this work referring to the *Salmonidæ* has been stereotyped, Professor Gill and the writer have been enabled to review the various species of that family found in the United States. Under the genus "*Salmo*," as defined in the text, at least four very distinct genera are confounded, which may be briefly diagnosed as follows:

* Anal fin elongate, of 14 to 17 rays, vomer narrow, long, flat, with weak teeth, no hyoid teeth; snout in adult males in the spawning season in typical species greatly distorted, the premaxillaries prolonged, hooking over the lower jaw, which in turn is greatly prolonged upward and forward and somewhat hooked at tip; the teeth of the premaxillaries and of the tip of the lower jaw being then greatly enlarged; a fleshy hump also developed before the dorsal fin; species, *black-spotted.* . . . . . . ONCORHYNCHUS, 1.

** Anal fin short, of 9—12 rays.

† Vomer flat, its toothed surface plane; teeth on the shaft of the vomer in two alternating rows or in one zigzag row, placed directly on the surface of the bone, not on a free

keel-like crest; (posterior vomerine teeth sometimes deciduous); species of various habit, *black-spotted*, the last rays of the dorsal and anal somewhat elongate. SALMO, 2.

†† Vomer somewhat boat-shaped, the shaft depressed and the teeth placed not directly on the shaft but on a raised crest, which is posteriorly free; a band of stout recurved teeth on the hyoid bone; scales small; caudal well forked; dorsal and anal not elevated behind; species of large size, *gray-spotted*, not anadromous, inhabiting American lakes. . . . . CRISTIVOMER, 3.

††† Vomer somewhat boat-shaped; the shaft depressed and *entirely toothless;* scales very small, in 225—250 rows; dorsal and anal not elevated behind; species of rather small size, *crimson-spotted*, the lower fins with marginal bands of black and pale; not anadromous, but sometimes descending to the sea, in salt water losing all markings and becoming nearly plain silvery. SALVELINUS, 4.

In the following account, I include all the species thus far known from the waters of the United States, as the general interest felt in this group of fishes seems to render this arrangement desirable.

1. ONCORHYNCHUS, Suckley. HOOKED-JAW SALMONS.

* Body not greatly compressed; upper jaw the longer; sexual peculiarities excessively developed; size large. (*Oncorhynchus.*)

. ***O. gorbuscha,*** (Walbaum) Gill & Jordan. HUMP-BACK SALMON. Scales very small, in more than 200 transverse rows. N. W. Coast. (*S. proteus*, Pallas. *S. gibber*, Bloch.)

2. ***O. keta,*** (Walb.) G. & J. EKEWAN. Scales medium, in 170 (155—180) rows; B. 16. N. W. Coast. (*S. scouleri*, Rich., *S. lagocephalus*, Pall., *S. confluentus*, Suckl.)

3. ***O. nerka,*** (Walb.) G. & J. Dog Salmon. Scales large, in 133 (120—140) rows; B. 13; C. feebly forked; form elongate, heavy forwards. N. W. Coast. (*S. lycaodon*, Pall., *S. canis*, *cooperi and richardi*, Suckley. *S. paucidens*, Rich.)

4. ***O. quinnat,*** (Rich.) Gthr. Quinnat. California Salmon. Scales large, in 120—140 rows; B. 15; C. well forked; body deepest mesially, less elongate. W. Coast, now largely introduced into Eastern waters. (*S argyreus*, Grd., *S. warreni*, Suckley.)

** Body oblong, very strongly compressed, back elevated, the dorsal fin posterior; mouth large, the lower jaw rather the longer; sexual peculiarities moderately developed; size small. (*Hypsifario*, Gill.)

5. ***O. kennerlii,*** (Suckl.) Jor. Red Salmon of the Chiloweyuck. Scales large, in 130—140 rows. W. U. S.

2. ***SALMO,*** Linnæus. Salmons.

(*Fario*, Val., *Salar*, Val., *Trutta*, Siebold.)

* Anadromous salmon with the vomerine teeth little developed, those on the shaft of the bone few, deciduous; scales large (in about 130 rows); caudal fin well forked, truncate in very old individuals; no hyoid teeth; lower jaws hooked upwards in breeding males, the upper jaw being then emarginate or perforate. (*Salmo.*)

1. ***S. salar,*** L. Common Salmon (see text). When landlocked in inland lakes, it becomes var. *sebago*. (*S. gloveri*, Grd., *S. omiscomaycus*, Walb.)

** River salmon, with the vomerine teeth largely developed, those on the shaft of the bone numerous, in one zigzag row, or in two alternating rows, persistent; caudal little forked. (*Salar*, Val.)

† Hyoid bone toothless.

a. Scales large, in 120—150 transverse rows; caudal fin forked.

2. ***S. irideus,*** Gibbons. PACIFIC BROOK TROUT. Form stout; head short, bluntish; mouth small, the maxillary scarcely reaching beyond eye. Streams W. of Sierra Nevada. (*S. newberrii*, Grd., *S. masoni*, Suckl.)

aa. Scales small, in 165—205 rows.

b. Caudal somewhat forked; head small, conical, rather pointed.

3. ***S. tsuppitch,*** Rich. BLACK TROUT OF LAKE TAHOE. Rather slender; mouth moderate; opercle prolonged backwards; scales in 180 rows. Streams W. of Sierra Nevada.

bb. Caudal double-rounded; head heavy, shortish, convex.

4. ***S. spilurus,*** Cope. BIG-MOUTHED TROUT. Mouth very large, the maxillary reaching much beyond eye; opercle not specially prolonged; black spots most numerous posteriorly. Rocky Mountain region, Wyoming to Arizona.

Var. ***pleuriticus,*** Cope. Scales small, in 200 rows; head carinate. Generally distributed.

Var. ***spilurus,*** (Cope). Scales larger, in 170 rows; head strongly convex. Utah to Colorado, etc.

† Hyoid bone with an elongate band of small teeth (easily scraped off by careless observers).

c. Head large and long—acuminate; hyoid teeth weak; caudal somewhat forked.

5. ***S. henshawi,*** G. & J. (*sp.n.*) SILVER TROUT OF LAKE TAHOE. Head little carinate; body elongate, not much compressed; scales in 160—184 rows. Streams of Cal.

cc. Head comparatively short and blunt; hyoid teeth rather strong; caudal less forked.

6. ***S. stomias,*** Cope. Scales in 200 rows; head broad and flat. Upper Missouri.

7. ***S. clarkii,*** Rich. MISSOURI TROUT. COLUMBIA RIVER TROUT. Head somewhat carinate. All streams from Rio Grande and Basin of Utah to Upper Missouri and Northwestward to the Pacific.

Var. ***clarkii.*** Scales 155—165. Streams of Oregon and Washington, chiefly W. of Cascade Range. (*S. stellatus*, Grd., *S. brevicauda* and *S. gibbsii*, Suckley.)

Var. ***aurora,*** (Grd.) Scales 165—175. Streams chiefly E. of the Cascade Range. (*S. lewisi & S. virginalis*, Grd., *S. carinatus*, Cope.)

3. *CRISTIVOMER,* Gill & Jordan. GREAT LAKE TROUTS.

1. ***C. namaycush,*** (Walb.) G. & J. MACKINAW TROUT. GREAT LAKE TROUT. LONGE TOGUE. (See text). Scales in 170—215 rows. Lakes, from Rocky Mountains to Maine, and northward. Individuals from Eastern Lakes vary somewhat, but can hardly be specifically distinct. Their scales average rather larger, the colors are often darker, and the gray spots sometimes tinged with red. (*S. confinis*, DeKay, *S. symmetrica*, Prescott, *S. toma*, Hamlin, *S. adarondacus*, Norris.)

2. ***C. siscowet,*** (Ag.) G. & J. SISCOWET. Differs from the preceding in the great fatness of the flesh, and in having all the bones of the head shortened and broadened; scales in 175—180 rows. Lake Superior.

4. *SALVELINUS,* Richardson. CHARRS.

(*Umbla*, Rapp. *Baione*, DeKay. *Salmo*, Siebold.)

* Hyoid bone with a median band of teeth.

a. Body elongate, slender, compressed; head quite small, with mouth smaller than in any other of our trouts, the maxillary not reaching to posterior margin of eye; caudal well forked; adipose fin small; red spots small, confined to the sides of the body.

1. ***S. oquassa,*** (Grd.) G. & J. Rangeley Lake Trout. (See text.)

aa. Body stout; head large, broad above, with large mouth, the maxillary reaching past eye; caudal little forked; adipose fin very large; red spots large, on back as well as on sides.

2. ***S. spectabilis,*** (Grd.) G. & J. Pacific Red-Spotted Trout. Streams W. of Sierra Nevada. (*S. campbelli* and *S. parkii*, Suckley.)

** Hyoid bone toothless; adipose fin small.

b. Head very large and pointed.

3. ***S. bairdii,*** (Suckl.) G. & J. "Dolly Varden Trout." Streams W. of Sierra Nevada.

bb. Head large; rather bluntish.

4. ***S. fontinalis,*** (Mitch.) G. & J. Common Speckled Trout. (See text.). D. 2, 11; A. 2, 9. Scales in 225 rows. Georgia (Little Tennessee River) to Lake Superior, Hudson's Bay, and Newfoundland; entering the sea, where it becomes the Canadian "Salmon Trout." (*S. hudsonicus* Suckley, *S. immaculatus* Storer, *S. canadensis* Smith, *S. hearnii* Rich.)

On page 274:

Genus **COREGONUS.**

I am indebted to Prof. James W. Milner of the U. S. Fish Commission, for an opportunity to examine some of the manuscript of his forthcoming review of the *Coregoni*, and to study a very full series of the specimens on which the review is based. For many of the conclusions below given, I am indebted to Prof. Milner, but for the generic and specific diagnoses and their arrangement here, the present writer only is responsible. The species referred in the text to *Coregonus*, fall into four well-marked groups, three of which at least may at present be regarded as genera, although they are much more closely related than the genera of Salmons. These genera or subgenera may be briefly defined as follows:

* Premaxillaries narrow, placed more or less nearly horizontally, the mandible elongate, its tip about even with that of the upper jaw; the general outline of the muzzle therefore rather pointed; bones of head generally elongate. ARGYROSOMUS, 1.

** Premaxillaries broad, placed vertically or turned inward, overlapping the tip of the lower jaw, the general outline of the muzzle therefore rather bluntish or truncate; mandible and bones of the head generally shortened.

‡ Supraorbital elongate; preorbital long and narrow; maxillary comparatively long, reaching to pupil; the small supplemental bone ovate in form, rather broad; mouth not very small. . . . . COREGONUS, 2.

‡‡ Supraorbital short, broadly ovate, cap-like; preorbital comparatively short and broad; maxillary short and rather broad, not reaching to the line of the eye; the small supplementary bone narrow and sharply elliptical; mouth very small, the snout more or less produced. PROSOPIUM, 3.

1. ARGYROSOMUS, Agassiz. CISCOES.

Body short, deep, compressed, shad-like; the sides strongly compressed; curve of the back similar to that of the belly; scales large, notably larger forwards, rather closely imbricated, the posterior margin little convex. (*Allosomus*, Jordan.)

1. ***A. tullibee,*** (Rich.) Ag. Depth 3 in length; at posterior point of adipose fin equal to length of caudal peduncle, 8½ in length; head 4 in length, conic and compressed; eye 4½ in head; maxillary reaching nearly to middle of eye; jaws equal; tongue with a patch of teeth; D. 2, 11; A. 2, 11; lat. l. 74, 8 rows above it and 7 below; white, each scale with a bright silvery patch, these forming very distinct silvery stripes along the rows of scales. Upper Great Lakes and N. A species of this type occurs also in the eastern part of Lake Erie.

** Body elongate, subfusiform, less compressed; dorsal and ventral outlines dissimilar; scales smaller, loose and uniform, posteriorly more convex. (*Argyrosomus.*)

2. **A. nigripinnis,** Gill. BLACK FIN. BLUE FIN. (See text.)

3. **A. artedi,** (Le Sueur) Hoy. COMMON LAKE HERRING. (See text.)

4. **A. hoyi,** Gill. Cisco of Lake Michigan. (See text.)

2. COREGONUS, Linnæus. WHITE FISHES.

* Body elongate; tongue with evident teeth.

1. **C. labradoricus,** Richardson. LAKE WHITING. BLACK CISCO. Body elongate, compressed, the depth 4½ in length; head long and slender, somewhat pointed, 4⅔ in length; mouth moderate, reaching front of pupil; dorsal high in front, 2, 11; A. 2, 11; lat. l, 80—84; about eight rows above and seven below; fins all blackish; color rather dark bluish, sides silvery. Lakes from Northern N. Y. to New Hampshire and Labrador. (*C. neohantoniensis*, Prescott.)

** Body stout, becoming deep and elevated with age; no teeth.

2. **C. clupeiformis,** (Mitchill) Milner. COMMON WHITE FISH. (See text, *C. albus.*) (*C. otsego*, Clinton.)

3. PROSOPIUM, Milner. ROUND WHITE FISH.

1. **P. quadrilaterale,** (Rich.) Milner. MENOMONEE WHITE FISH. (See text.) The Shad-waiter (*C. novanglicæ*, Prescott) of the lakes of N. N. Y. and N. H., is apparently identical with this species.

2. **P. couesii,** Milner. CHIEF MOUNTAIN WHITE FISH. (See text.). (For further Addenda, see page 403.)

LIST OF PAPERS

OF WHICH USE HAS BEEN MADE IN THE PREPARATION OF THIS WORK.

The following list comprises many of the books and memoirs which have been found useful to the author in the preparation of this work. It is not designed to be exhaustive, and except in the department of Fishes, it is not at all full. The recent elaborate works on Mammals and Birds render references to earlier writings less necessary in the study of those animals than in the study of the Fishes, all the literature pertaining to the latter being, as yet, more or less scattering and incomplete.

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GLOSSARY

OF THE

Principal Technical Terms

USED IN THIS WORK.*

Abdomen—Belly.

Abdominal—Pertaining to the belly—said of the ventral fins of fishes when inserted considerably behind the pectorals, away from the shoulder girdle.

Abortive—Remaining or becoming imperfect.

Acuminate—Tapering gradually to a point.

Acute—Sharp-pointed.

Adipose fin—A peculiar, fleshy, fin-like projection on the backs of Salmons, Cat Fishes, etc., behind the dorsal fin.

Air bladder—A sac filled with air, lying beneath the back-bone of fishes, corresponding to the lungs of the higher vertebrates

Allantois—An organ of the embryo.

Altrices—Birds reared in the nest and fed by the parents.

Altricial—Having the nature of *Altrices*.

Alula—The feathers attached to the "thumb" of a bird.

Alveolar surface—A portion of the jaw of a turtle, where the teeth-sockets (alveola) might be expected to be.

Amnion—An organ of the embryo.

Amphicœlian—Biconcave—said of vertebræ.

Anadromous—Said of marine fishes which run up rivers to spawn.

Anal—Pertaining to the anus or vent.

Anal fin—The fin on the median line, behind the vent, in fishes.

Anal plate—The plate, immediately in front of the vent, in serpents.

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* In the preparation of this Glossary, the author has largely drawn from Dr. Coues' "Glossary of the Technical Terms used in Descriptive Ornithology," in Baird, Brewer and Ridgway's History of North American Birds, Vol. III. pp. 535—560.

Anteorbital plate—The plate, in front of the eye, in serpents.

Antrorse—Turned forwards.

Anus—The external opening of the intestines.

Arterial bulb—The muscular swelling, at the base of the great artery, in fishes, etc.

Articulated—Jointed.

Artiodactylous—Even-toed (toes 2 or 4.)

Attenuate—Long and slender, as if drawn out.

Auricle—The large lobe of the external ear; also, one of the chambers of the heart.

Barbel—An elongated fleshy projection, usually about the head, in fishes.

Basal—Pertaining to the base; at or near the base.

Beak—The bill of birds, or (in other animals) any beak-like structure.

Bend of Wing—Angle at the carpus when the wing is folded.

Bicolor—Two-colored.

Booted—Said of the tarsus, when its scales coalesce and form a continuous envelope.

Branchiæ—Gills; respiratory organs of fishes, etc.

Branchial—Pertaining to the gills.

Branchiostegals—The bony rays supporting the branchiostegal membranes, under the head of a fish, below the opercular bones, and behind the lower jaw.

Bristle—A stiff hair, or hair-like feather.

Caducous—Falling off early.

Calcareous—Containing or composed of carbonate of lime.

Canines—The teeth behind the incisors — the "eye-teeth"; in fishes, teeth in the front part of the jaws, longer than the others.

Carapace—The upper part of the shell of a turtle.

Carinate—Keeled, having a ridge along the middle line.

Carpus—The wrist.

Caudal—Pertaining to the tail.

Caudal fin—The fin on the tail of fishes.

Caudal peduncle—The region between the anal and caudal fins in fishes.

Cavernous—Containing cavities, either empty or filled with a mucous secretion.

Cere—Fleshy, cutaneous or membranous covering of the base of the bill in many birds, particularly the Owls, Hawks, and Parrots.

Cervical—Pertaining to the neck.

Chiasma—Crossing of the fibres of the optic nerve.

Chin—The space between the forks of the lower jaw.

Ciliated—Fringed with eye-lash-like projections.

Cinereous—Ashy in color.

Clamatorial—Pertaining to or like the *Clamatores*.

Clavicle—The collar bone.

Cœcal—Of the form of a blind sac.

Cœcum—An appendage of the form of a blind sac, connected with the alimentary canal.

Commissure—The line on which the mandibles of a bird are closed.

Compressed—Flattened laterally.

Condyle—Articulating surface of a bone.

Conirostral—Said of a bill like that of a Sparrow; conical in form and with the commissure angulated.

Costal folds—Folds of the skin (of a Salamander) showing the position of the ribs.

Crest—In birds, any lengthened feathers about the head; elsewhere, any elevated or crest-like projection.

Crissum—The under tail coverts, in birds.

Ctenoid—Rough-edged, said of scales when the posterior margin is minutely spinous or pectinated.

Culmen—The middle line or ridge of the upper mandible in birds.

Cuneate—Wedge-shaped; said of a bird's tail when the middle feathers are longest and the rest regularly shorter.

Cycloid—Smooth-edged; said of scales not ctenoid, but concentrically striate.

Deciduous—Temporary, falling off.

Decurved—Curved downward.

Dentate—With tooth-like notches.

Dentirostral—Having the bill notched near its tip.

Depressed—Flattened vertically.

Depth—Vertical diameter (usually of the body of fishes.)

Dermal—Pertaining to the skin.

Diaphanous—Translucent.

Digitigrade—Walking on the toes, like a dog.

Dorsal—Pertaining to the back.

Dorsal fin—The fin on the back of fishes.

Emarginate—Slightly forked or notched at the tip, or sometimes abruptly narrowed (said of quills.)

Endoskeleton—The skeleton proper—the inner bony framework of the body.

Epignathous—Having the bill hooked.

Erectile—Susceptible of being raised or erected.

Even—(*Tail*) having all the feathers of equal length.

Exoskeleton—Hard parts on the surface of the body.

Exserted—Projecting beyond the general level.

Facial—Pertaining to the face.

Falcate—Scythe-shaped; long, narrow, and curved.

Falciform—Curved, like a scythe.

Fasciated—With broad colored bands.

Fauna—The animals inhabiting any region, taken collectively.

Ferrugineous—Rusty red.

Fibula—The small outer leg bone.

Filament—Any slender or thread-like structure.

Filiform—Thread-form.

Fissirostral—Having the bill very deeply cleft, beyond the base of the horny part, as in the Swallows.

Forehead—Frontal curve of head.

Foramen—A hole or opening.

Forficate—Deeply forked.

Fossæ—The grooves in which the nostrils of many birds open.

Fossorial—Adapted for digging.

Fulcra—Rudimentary spine-like scales extending up the fins of some fishes.

Fuliginous—Sooty or smoky brown.

Furcate—Forked.

Fuscous—Dark brown.

Fusiform—Spindle-shaped; tapering toward both ends but rather more abruptly forward.

Gape—Opening of the mouth.

Ganoid—Scales or plates of bone covered by enamel.

Gastrosteges—Band-like plates along the belly of a serpent.

Gills—Organs for breathing the air contained in water.

Gill openings—Openings leading to or from the branchiæ.

Gill rakers—A series of structures like comb-teeth in the mouth of some fishes.

Glabrous—Smooth.

Gonys—The middle line of the lower mandible.

Gorget—Throat patch of peculiar feathers.

Graduated—Said of a bird's tail when the outer feathers are regularly shorter.

Granulate—Rough with small prominences.

Gular—Pertaining to the *gula*, or upper fore-neck.

Guttate—With rounded, drop-shaped spots.

Hallux—The great toe—in birds, the hind toe.

Height—Vertical diameter—practically the same as depth.

Heterocercal—Said of the tail of a fish, when unequal—the back-bone evidently running into the upper lobe.

Hirsute—With shaggy hairs.

Homocercal—Said of the tail of a fish when not evidently unequal; the back-bone apparently stopping at the middle of the base of the caudal fin.

Humerus—Bone of the upper arm.

Hyoid—Pertaining to the tongue.

Hypognathous—Having the lower mandible longer than the upper, as in the Black Skimmer.

Imbricate—Overlapping, like shingles on a roof.

Imperforate—Not pierced through.

Inarticulate—Not jointed.

Incisors—The front or cutting teeth.

Interfemoral membrane—The membrane connecting the posterior limbs of a bat.

Intermaxillaries—The bones between the superior maxillaries, forming the middle of the front part of the upper jaw, in fishes: the premaxillaries.

Jugular—Pertaining to the lower throat—said of the ventral fins, when placed in advance of the attachment of the pectorals.

Keeled—See *Carinate*.

Labials—Plates forming the lip of a serpent.

Lamellæ—Plate-like processes inside of the bill of a duck.

Lamellate—Said of a bill provided with lamellæ, as in a duck.

Lateral—To or towards the side.

Lateral line—A series of muciferous tubes forming a *raised line* along the sides of a fish.

Laterally—Sidewise.

Lobate—Furnished with membranous flaps—said of the toes of birds.

Longitudinal—Running lengthwise.

Loral plate—Plate between eye and mouth of a serpent.

Lore—Space between eye and bill.

Mailed cheeks—Having the suborbital bone extending over the cheeks, articulating with the preopercle (cheeks not necessarily hard or bony); said of some fishes.

Mandible—Under jaw (or in birds, either jaw.)

Maxilla—Upper jaw.

Maxillaries—Outermost or hindmost bones of the upper jaw, in fishes.

Metacarpus—The hand proper, exclusive of the fingers.

Metatarsus—The foot proper. (See *Tarsus.*)

Molars—The grinding teeth; posterior teeth in the jaw.

Moniliform—Necklace-shaped—widened at regular intervals.

Monogamous—Pairing; said of birds.

Muciferous—Producing or containing mucus.

Nape—Upper part of neck, next to the occiput.

Nasal—Pertaining to the nostrils.

Neural—Pertaining to nerves.

Nictitating membrane—The third or inner eye-lid, of birds, etc.

Nuchal—Pertaining to the nape or *nucha.*

Obscure—Dark, scarcely visible.

Obsolete—Faintly marked; little evident.

Obtuse—Blunt.

Occipital—Pertaining to the occiput.

Occipital plates—Plates on the head of a serpent, behind the vertical plate.

Occiput—Back of the head.

Ocellate—With eye-like spots, generally roundish and with a lighter border.

Ocherous—Brownish yellow.

Oid (*suffix*)—Like—as *Percoid*, perch-like.

Opercle, or operculum—Gill cover; the posterior membrane bone of the side of the head, in fishes.

Opercular bones—Membrane bones of the side of the head, in fishes.

Opercular flap—Prolongation of the upper posterior angle of the opercle, in Sun-Fishes, etc.

Opisthocœlian—Concave behind; said of vertebræ.

Orbicular—Nearly circular.

Orbit—Eye socket.

Oscine—Musical.

Oscine tarsus—By ellipsis, tarsus as in oscine birds; *i. e.*, its envelope undivided behind and forming a sharp ridge.

Oviparous—Producing eggs which are developed after exclusion from the body, as in all birds.

Ovoviviparous—Producing eggs which are hatched before exclusion, as in the Blind Fish and Garter Snake.

Palate—The roof of the mouth—in fishes, a part of the roof of the mouth, lying behind the vomer and in front of the pharyngeals (not to be confounded with either.)

Palatines—Bones of the palate.

Palmate—Web-footed, having the anterior toes full-webbed.

Papilla—A small, fleshy projection.

Papillose—Covered with papillæ.

Paragnathous—Having the two mandibles about equal in length.

Pectinate—Having teeth like a comb.

Pectoral—Pertaining to the breast.

Pectoral fins—The anterior or uppermost of the paired fins, in fishes, corresponding to the anterior limbs of the higher Vertebrates.

Pelage—The hair of a Mammal, taken collectively.

Pelagic—Living on or in the high seas.

Perforate—Pierced through; said of nostrils when without a septum.

Perissodactylous—Odd-toed (toes 1, 3, or 5.)

Peritoneum—The membrane lining the abdominal cavity.

Phalanges—Bones of the fingers and toes.

Pharyngeal bones—Bones at the beginning of the œsophagus of fishes, of various forms, almost always provided with teeth.

Pharyngognathous—Having the lower pharyngeal bones united.

Pigment—Coloring matter.

Plantigrade—Walking on the sole of the foot, as do men and bears.

Plastron—Lower shell of a turtle.

Plicate—Folded; showing transverse folds or wrinkles.

Plumage—The feathers of a bird, taken collectively.

Plumbeous—Lead-colored—dull bluish gray.

Pollex—Thumb; in birds, the digit which bears the alula—corresponding to the index finger.

Polygamous—Mating with more than one female.

Præcoces—Birds able to run about and feed themselves at birth.

Præcocial—Having the nature of *Præcoces*.

Premaxillaries—Same as intermaxillaries.

Premolars—The small grinders; the teeth between the canines and the true molars.

Preopercle—The membrane bone lying in front of the opercle and more or less nearly parallel with it; the "false gill covers."

Primary—Any one of the ten (often nine, rarely eleven) of the large, stiff quills growing upon the pinion or hand-bone of a bird, as distinguished from the secondaries, which grow upon the fore arm.

Primary Wing Coverts—The coverts overlying the bases of the primaries.

Projectile—Capable of being thrust forward.

Protractile—Capable of being thrust forward.

Pulmonary—Pertaining to the lungs.

Punctate—Dotted with points.

Pyloric cœca—Glandular appendages in the form of blind sacs opening into the alimentary canal of many fishes at the *pylorus* or passage from the stomach to the intestine.

Quadrate—Nearly square.

Quadrilocular—Four-chambered—said of the heart.

Quill—One of the stiff feathers of the wing or tail of a bird.

Quincunx—Set of five arranged alternately, thus
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* *

Radius—Outer bone of fore arm.

Ray—One of the cartilaginous rods which support the membrane of the fin of a fish.

Rectrices—Quills of the tail of a bird.

Recurved—Curved upward.

Remiges—Quills of the wing of a bird.

Reticulate—Marked with a network of lines.

Retractile—Susceptible of being drawn inward, as a cat's claw.

Retrorse—Directed backward.

Rictal—Pertaining to the rictus, as *rictal* bristles.

Rictus—Gape of the mouth.

Rostral—Pertaining to the snout, as rostral plate.

Rudimentary—Undeveloped.

Ruff—A series of modified feathers.

Scansorial—Capable of climbing.

Scansorial tail—Tail feathers sharp and stiff, as in the scansorial birds (Woodpeckers).

Scapula—Shoulder blade.

Scutellate—Provided with scutella; said of the tarsus when covered with broad plates in a regular vertical series, and separated by regular lines of impression.

Scutellum—One of the tarsal plates or scutella.

Secondaries—The quills growing on the fore arm.

Second dorsal—The posterior or soft part of the dorsal fin, when the two parts are distinctly separated.

Sectorial tooth—One of the premolars of carnivora, adapted for cutting.

Semipalmate—Half-webbed; having the anterior toes more or less connected at base by a webbing which does not extend to the claws.

Septum—A thin partition.

Serrate—Notched, like a saw.

Sessile—Without a stem or peduncle.

Setaceous—Bristly.

Shoulder girdle—The bony girdle posterior to the head, in fishes, etc., to which the anterior limbs are attached.

Soft dorsal—The posterior part of the dorsal fin in fishes, when composed of soft rays.

Soft rays—Fin-rays which are branching and articulate.

Spine—Any sharp projecting point; in fishes, those fin-rays which are unbranched, inarticulate, and usually more or less stiffened.

Spinous—Stiff, or composed of spines.

Spinous dorsal—The anterior part of the dorsal fin in fishes, when composed of spinous rays.

Spiracles—Openings in the head or neck of some fishes and Batrachians.

Spurious—Said of the first primary when less than about one-third the length of the second. (The student will notice that in *Oscines* the *presence* of a short or spurious quill indicates *ten* primaries; its *absence*, *nine*.)

Sternum—The breast bone.

Striate—Striped or streaked.

Sub (in composition) — Less than; somewhat; not quite; under, etc.

Suffrago—Heel joint; tibio—tarsal joint.

Sub-caudal—Under the tail.

Sub-opercle—The bone immediately below the opercle.

Sub-orbital—Below the eye.

Subulate—Awl-shaped.

Superciliary—Pertaining to the region of the eyebrow.

Supra-orbital—Above the eye.

Syndactyle—Having two toes immovably united for some distance —as in the Kingfisher.

Synonym—A different word having the same or a similar meaning.

Tail—In mammals, the vertebræ, etc., posterior to the sacrum; in birds, the tail-feathers or rectrices, taken collectively; in serpents, the part of the body posterior to the vent; in fishes (usually), the part of the body posterior to the anal fin. (Everywhere used more or less vaguely.)

Tail Coverts—The small feathers overlapping the bases of the rectrices.

Tarso-metatarsus—The correct name for the so-called tarsus of birds; the bone reaching from the tibia to the toes, composed chiefly of the metatarsus, but having at its top one of the small tarsal bones confluent with it.

Tarsus—The ankle-bones collectively; in birds, commonly used for the shank-bone, lying between the tibia and the toes, the *tarso-metatarsus*.

Tectrices—The wing and tail coverts.

Temporal—Pertaining to the region of the temples.

Tenuirostral—Slender-billed.

Terete—Cylindrical and tapering.

Terminal—At the end.

Tertials—The quills attached to the humerus.

Tessellated—Marked with little checks or squares, like mosaic work.

Thoracic—Pertaining to the chest; ventral fins are thoracic when attached immediately below the pectorals, as in the perch.

Tibia—Shin-bone; inner bone of leg between knee and heel.

Tomium—Cutting edge of the bill.

Totipalmate—Having all *four* toes connected by webbing.

Tragus—The inner lobe of the ear; the lobe opposite the auricle.

Transverse—Crosswise.

Trenchant—Compressed to a sharp edge.

Truncate—Abrupt, as if cut squarely off.

Tubercle—A small excrescence, like a pimple.

Tympanum—Drum of the ear; external in some Batrachia.

Typical—Of a structure the most usual in a given group.

Ulna—The inner or posterior bone of the fore-arm.

Ungulate—Provided with hoofs.

Unguiculate—Provided with claws.

Unicolor—Of a single color.

Urosteges—The plates underneath the tail of a serpent.

Vent—The external opening of the alimentary canal.

Ventral—Pertaining to the abdomen.

Ventral fins—The paired fins behind or below the pectoral fins in fishes, corresponding to the posterior limbs in the higher vertebrates.

Ventral plates—Gastrosteges in serpents.

Ventricle—One of the chambers of the heart.

Versatile—Capable of being turned either way.

Vertebra—One of the bones of the spine.

Vertical—Up and down.

Vertical fins—The fins on the median line of the body; the dorsal, anal and caudal fins.

Vertical plate—Central plate on the head of a serpent.

Villiform—Said of the teeth of fishes when slender and crowded into velvety bands.

Viscous—Slimy; viscid.

Vitta—A band of color.

Viviparous—Bringing forth living young.

Vomer—In fishes, the front part of the roof of the mouth; a bone lying immediately behind the premaxillaries.

Web—The vane of a feather, on either side of the rhachis or "stem"; also, the membrane connecting the toes.

Zygodactyle—Yoke-toed; having the toes in pairs—two in front, two behind.

Zygoma—The malar or cheek bone.

GLOSSARY

OF

SPECIFIC NAMES.

The following Glossary includes all the Specific Names mentioned in this work, with the exception of words formed from names of persons, and of a few words whose meaning I have been unable to ascertain. They are all of Latin origin unless otherwise specified:

abacurus: Gr. checkered tail.
acadiacus: Acadian.
achigan: a Canadian French name for the bass.
acutus: acute.
adamantinus: like a diamond.
aedon: Gr. a nightingale.
ælurus: Gr. a cat.
æneus: brassy, or coppery.
æpypterus: Gr. high-finned.
æsopus: Gr. different-footed.
æstivalis: pertaining to summer.
æstivus: summer.
affinis: akin to.
agilis: agile.
agrestis: living in fields.
albeolus: whitish.
albicollis: white-throated.
albidus: whitish.
albifrons: white-fronted.
albus: white.
alcyon: halcyon—a sea-bird—during whose nesting there is always a calm.
alexandrinus: Alexandrian (Egyptian).
alleghaniensis: Alleghanian.
alpestris: alpine.
alpinus: alpine.
altus: high or deep.
amabilis: amiable.
amarus: bitter (salt water).
americanus: American.
amœnus: pleasing.
anagallinus: color of Scarlet Pimpernel.
analostanus: Analostan Island.
anglicus: English.
anisurus: Gr. tail unequal.
annularis: ringed.
anomalus: anomalous.
anthracinus: coal-black.
antillarum: living in the Antilles.
appendix: an appendage.
aquaticus: aquatic.
arcticus: arctic.
arctos: Gr. a bear.
ardens: burning.
ardesiacus: glittering.
arenarius: living in sand.
arge: Gr. sluggish.
argentatus: silvered.
argenteus: silvery.
argyritis: silvery.
ariommus: Gr. big-eyed.
artedi: to Peter Artedi, "the father of Ichthyology."
asio: a horned owl.
asper: rough.
aspro: a genus of European Percoids.
ater: black.
atrarius: blackish.
atratus: blackened.
atricapillus: black-capped.
atricillus: blackish.
atripinnis: black-finned.

atrofuscus: blackish-brown.
atromaculatus: black-spotted.
atronasus: black-nosed.
aura: pertaining to air.
aurantiacus: orange.
auratus: golden.
aureolus: gilded.
aureus: golden.
auricapillus: golden-crowned.
auritus: long-eared.
aurora: sunrise.
austerus: austere.
baltimore: to Lord Baltimore, in sportive allusion to his black coat and scarlet vest.
bernicla: a barnacle-goose.
bicolor; two-colored.
bifrenatus: two-bridled (stripe through snout).
biguttatus: two-spotted.
bilineatus: two-lined.
bimaculatus: two-spotted
bison; a buffalo.
blennioides: blenny-like.
blennioperca; blenny-perch.
boleoides: darter-like.
borealis: northern.
boreus: northern.
boschas: a kind of duck.
bostoniensis: Bostonian.
brachyotus: Gr. short-eared.
branta; brant.
brevicauda: short-tailed.
breviceps: short-headed.
brevirostris: short-billed.
brosmianus: like a cusk.
brunneus: brown.
bubalinus: buffalo-like.
bubalus: buffalo.
buccatus: big-jawed.
buccinator: trumpeter.
bucco: big-cheeked.
bullaris: bubbling.
bursarius: purse-bearing.
cæruleus: blue.
cærulescens: bluish.
californicus: Californian.
calligaster: Gr. beautiful belly.
callipteryx: Gr. beautiful-finned.
calendulus: a little lamp.
calvus: bald.
camurus: decurved.
canadensis: Canadian.
candidissimus: most white.
caninus: dog-like.
canis: a dog.
cantabrigensis: from Cambridge.
cantiacus: Kentish.
canutus: hoary.
caprodes: Gr. like a pig.
carbo: coal-black.
caribæus: Caribbean.
caribou: French Canadian name.
carinatus: keeled.
carnivorus: carnivorous.
carolinensis: Carolinian.
carolinus: Carolinian.
carpio: a carp.
caspius: Caspian.
castaneus: chestnut-colored.
cataractæ: from Niagara Falls.
cataractus: a cataract.
catenatus: with chain-like lines.
catulus a kitten.
catus: a cat.
caudacutus: sharp-tailed.
caudafurcatus: fork-tailed.
caudatus: long-tailed.
cavifrons: having the front concave.
cayuga: Cayuga Lake.
cedrorum: living among cedars.
celatus: concealed.
cephalus: Gr. big-headed.
cervinus: tawny, like a deer.
chætodon: a marine genus.
chalybæus: steel-colored.
charybdis: a somewhat noted whirlpool.
chrysaetus: Gr. golden eagle.
chrysocephalus: Gr. golden-headed.
chrysochloris: Gr. golden-green.
chrysoleucus: Gr. golden-white.
chrysops: Gr. golden-eyed.
chrysopsis: Gr. golden appearance.
chrysopterus: Gr. golden-winged.
cinereoargentatus: silver-gray.
cinereus: ashy-gray.
circulosus: with circles or rings.
ciris: a water-bird of some kind.
citræus: citron-yellow.
clamitans: screaming.
clangula: a sharp bird's scream.
clausus: closed.
clupeiformis: herring or shad-shaped.
clypeata: shielded.
coccogenis: Gr. scarlet-cheeked.
cœnosus: muddy.
collapsus: slab-sided.

collaris: collared.
colubris: pertaining to a snake.
columbarius: pertaining to a dove.
columbianus: Columbian.
communis: common.
compressus: compressed.
concinnus: handsome.
concolor: one-colored.
confinis: confined (in its range).
conspersus: bespattered.
constrictor: one that hugs.
contortrix: contorted.
conus: a cone.
corax: a raven.
coregonus: a white-fish.
cornutus: horned.
coronatus: crowned.
corporalis: big-bodied.
crassilabris: thick-lipped.
crepitans: screaming.
crepuscularis: pertaining to twilight.
crinitus: long-haired.
cristatus: crested.
cucullatus: hooded.
cunicularius: pertaining to a cony (prairie dog).
cupido: Cupid.
cupreus: coppery.
curvirostra; curved-billed.
cutisanserinus: goose-skinned.
cyanellus: Gr. bluish.
cyaneus: Gr. blue.
cyanocephalus: Gr. blue-headed.
cyanonoton: Gr. blue-backed.
cyclotis: Gr. rounded.
cymatogrammus: Gr. wavy-lined.
cypho: humpback.
cyprinella: a small carp.
cyprinus: a carp.
delawarensis: Delaware.
diaphanus: transparent.
difformis: deformed.
dilectus: delightful.
dilophus: Gr. two-crested.
dinemus: Gr. two-threaded (a lateral line and a lateral streak).
diplæmius: Gr. doubly-bloody.
discolor: two-colored.
discors: discordant.
dispar: dissimilar.
dissimilis: dissimilar.
doliatus: sorrowful.
domesticus: domestic.
dominicus: from San Domingo.
dorsalis: dorsal.
dorsatus: pertaining to the back.
dubius: dubious.
duquesnii: from Fort DuQuesne (Pittsburg).
durissus: hard.
eburneus: ivory.
effulgens: shining.
egretta: Italian—an Egret.
elapsoidea: like Elaps.
elegans: elegant.
eleutherus: Gr. free.
ellipticus: elliptical.
elongatus: elongate.
enucleator: one who takes the seed from the husk.
eos: Gr. color of sunrise.
erebennus: Gr. jet-black.
eriarchus: Gr. with a large anal fin.
ermineus: ermine.
erythrocephalus: Gr. red-headed.
erythrogaster: Gr. red-bellied.
erythrogrammus: Gr. red-lined.
erythronotus: Gr. red-backed.
erythrophthalmus: Gr. red-eyed.
erythrurus: Gr. red-tailed.
estor: devourer.
euryops: Gr. wide-faced.
evides: Gr. comely.
excubitoroides: like excubitor — a sentinel.
exilipes: slender-footed.
exilis: slender.
eximius: excellent.
falcinellus: *falx*—a scythe.
fallax: deceptive.
familiaris: familiar.
fasciatus: banded.
ferinus: wild.
ferox: ferocious.
ferrugineus: rust-colored.
fiber: a beaver.
fissipes: cloven-footed.
flabellaris: fan-shaped.
flabellatus: fan-shaped.
flammeus: flame-colored.
flavescens: yellowish.
flavifrons: yellow-fronted.
flavipes: yellow-footed.
flavirostris: yellow-billed.
flaviventris: yellow-bellied.
flavus: yellow.
floridanus: Floridian.
fluviatilis: living in rivers.

folium: a leaf.
fontinalis: living in fountains.
forficatus: deeply forked.
formosus: comely.
fretensis: inhabiting straits (Detroit River).
frontalis: forehead prominent.
frugivorus: eating fruits.
fulicarius: like a coot.
fulvus: reddish-yellow.
funduloides: like Fundulus.
furcatus: forked.
fuscescens: somewhat dusky or tawny.
fuscicollis: dusky-throated.
fuscus: dusky.
fusiformis: fusiform.
galacturus: Gr. milky-tailed.
galeatus: helmeted.
gallopavo: *Gallus:* a cock; *Pavo:* a peacock.
garrulus: garrulous.
gavialis: like a crocodile.
geographicus: map-like.
georgianus: Georgian.
gibber: gibbous.
gibbosus: with rounded outlines.
gilvus: pale yellow.
glacialis: icy.
gladius: a sword.
glaucus: glaucous.
glutinosus: viscid.
gobioides: goby-like.
gobioninus: gudgeon-like.
gorbuscha: a Kamtschatkan name.
gracilis: slender.
grammacus: Gr. striped.
gramineus: pertaining to grass.
griseus: gray.
grunniens: grunting.
gryllus: a cricket.
gulosus: big-mouthed.
guttatus: with drop like spots.
gyrfalco: a gyr-falcon.
gyrinus: Gr. a tadpole.
hæmaturus: Gr. bloody-tailed.
halecinus: halec—a shad (appears in shad-run season).
haliaetus: Gr. a sea-eagle.
harengus: a herring.
helveticus: Swiss.
herodias: Gr. a heron.
heros: a genus of Cichlidæ.
heteroclitus: Gr. different slope.
heterodon: Gr. teeth otherwise.
heterurus: Gr. tail uneven.
hexacanthus: Gr. six-spined.
hieroglyphicus: Gr. marked with crow-tracks.
himantopus: Gr. crook-shanks.
hirudo: a leech.
hirundo: a swallow.
horiconensis: from Lake George.
horreorum: inhabiting barns.
horribilis: horrible.
horridus: horrid.
hudsonicus: from Hudson's Bay or River.
hudsonius: Hudsonian.
humeralis: a spot on the shoulder.
humilis: humble.
huronensis: Lake Huron.
hyalinus: transparent.
hybridus: hybrid.
hyemalis: wintery.
hyperboreus: Gr. far-northern.
hypogæus: Gr. underground.
ichtheloides: like a sunfish.
icterocephalus: Gr. oriole-headed.
iliacus: Trojan (why?).
immaculatus: unspotted.
incisor: one that cuts.
inconstans: inconstant.
ingens: prodigious.
inornatus: not ornamented.
inscriptus: inscribed.
insculptus: sculptured.
insignis: insignificant.
insociabilis: unsociable.
intermedius: intermediate.
interpres: an interpreter.
interruptus: interrupted.
irideus: rainbow-colored.
ischanus: Gr. thin.
ischyrus: Gr. stout.
islandicus: Iceland.
isolepis: Gr. equal-scaled.
jaculus: something thrown.
jamaicensis: Jamaican.
kentuckiensis: Kentuckian.
keta: a Kamtschatkan name.
labradorius: Labradorian.
labradoricus: Labradorian.
lacertinus: lizard-like.
lacertosus: lizard-like.
lacerus: torn.
lachrymalis: pertaining to tears.
lacustris: living in lakes.

lævis: smooth.
lagopus: Gr. rough-footed, like a rabbit.
lapponicus: pertaining to Lapland.
lariformis: shape of a gull.
lateralis: pertaining to the side.
latior: broader.
latrans: barking.
leberis: thick-skinned.
lemniscatus: adorned with ribbons.
leptacanthus: Gr. slender-spined.
leuciodus: Gr. whitened.
leucobronchialis: Gr. white-throated.
leucocephalus: Gr. white-headed.
leucophrys: Gr. white-crowned.
leucops: Gr. white-eyed.
leucopsis: Gr. white-faced.
leucopterus: Gr. white-finned.
leucopus: Gr. white-footed.
leucurus: Gr. white-tailed.
limi: pertaining to mud.
limosus: muddy.
lineatus: lined (with narrow stripes).
lineolatus: finely-lined.
liosternus: Gr. smooth-breasted.
lirus: Gr. lily-white.
lividus: livid.
livius: dove-colored.
loculator: a big-talker.
longicaudus: long-tailed.
longiceps: long-headed.
longirostris: long-snouted.
longirostrum: long-snout.
lophius: the fishing frog.
lotor: one who washes (from the raccoon's habit of washing his paws and everything else in reach).
louisianensis: Louisianian.
lucidus: shining.
lucifugus: shunning the light.
lucioides: like a pike.
lucius: a pike.
ludovicianus: Louisianian.
lunatus: crescent-shaped.
lunifrons: crescent forehead.
lupus: a wolf.
luscus: one-eyed (from the condition of Linnæus' unfortunate specimen).
lycaodon: Gr. wolf-toothed.
lynx: a wild-cat.
lythrochloris: Gr. bloody-green.
macrocephalus: Gr. long-headed.
macrochirus: Gr. long-armed.
macrolepidotus: Gr. large-scaled.
macropterus: Gr. large-finned.
macrotis: G. large-eared.
macrurus: Gr. long-tailed.
macularius: spotty.
maculaticeps: spotted-headed.
maculatus: spotted.
maculosus: spotted.
magnus: large.
mainensis: Maine.
majalis: pertaining to May.
manitou: Lake Manitou.
margaritus: pearly.
margarotis: Gr. pearly-eared.
marginatus: margined.
marinus: marine.
maritimus: maritime.
marmoratus: marbled.
martes: a marten.
martinicus: from Martinique.
maxillilingua: jaw-tongue.
means: moving.
megalotis: Gr. big-eared.
melanoleucus: Gr. black-and white.
melanops: Gr. black-eyed or faced.
melanostictus: Gr. black spotted.
melas: Gr. black.
meleagris: a fowl.
melodius: melodious.
melodus: melodious.
menona: Lake Menona.
mephiticus: ill-scented.
merganser: diving-goose.
meridionalis: southern.
mesotrema: Gr. vent intermediate.
mexicanus: Mexican.
michiganensis: Michigan.
micropteryx: Gr. small-finned.
microstomus: Gr. small-mouthed.
migratorius: migratory.
miniatus: vermilion color.
minimus: smallest.
mineopas: Lake Minneopa, Minn.
minor: smaller.
minutillus: minute.
mississippiensis: Mississippian.
missuriensis: Missourian.
mitratus: mitred.
miurus: Gr. curtailed; notched.
molestus: uneasy.
mollissimus: softest.
monachus: solitary.
monax: a hermit.
montanus: pertaining to mountains
monticolus: living in the mountains

mordax: biting; snapping.
motacilla: wag-tail.
mucronatus: abruptly and sharply pointed.
mugitans: mooing, like a cow.
multifasciatus: many-banded or striped.
multilineatus: many-lined.
musculus: a little mouse.
mustelinus: color of a weasel (foxy red).
muticus: unarmed.
nævius: with small spots.
namaycush: Indian name.
nasutus: long-nosed.
natalis: with a projecting rump.
nebulosus: cloudy.
neglectus: neglected.
neogæus: Gr. New World.
neohantoniensis: New Hampshire.
nephelus: Gr. clouded.
nerka: a Kamtschatkan name.
niger: black.
nigricans: blackish.
nigricollis: black-throated.
nigrilabris: black-lipped.
nigripinnis: black-finned.
nigrofasciatus: black-barred.
nigromaculatus: black-spotted.
nitidus: shining.
nivalis: snowy.
niveiventris: white-bellied.
niveus: snow-white.
nobilis: noble.
nobilior: nobler.
noctivagans: wandering at night.
notatus: known (as by a spot, hence spotted).
novæangliæ: New England.
noveboracensis: New York.
nuchalis: pertaining to the nape.
nummifer: money-bearing (nickel color).
obesus: fat.
oblongus: oblong.
obscurus: dusky.
obsoletus: obsolete.
obtusus: obtuse.
occidentalis: western.
occipitomaculatus: back of head spotted.
ocellicaudus: ocellate spots on tail.
ochrophæus: Gr. dark orange-brown.
oculatus: with eye-like spot.
odoratus: odorous.
olivaceus: olivaceous.
olivaris: olivaceous.
omiscomaycus: an Indian name for a Smolt.
opacus: opaque.
oquassa: Lake Oquassa.
ordinatus: in rows (spots).
oregonensis: Oregonian.
oregonus: Oregonian.
ornatus: ornamented.
oryzivorus: rice-eating.
osculus: small-mouthed.
osmerinus: like a smelt.
osseus: bony.
ossifragus: bone-breaking.
otsego: Lake Otsego.
oxyurus: Gr. sharp-tailed.
palmarum: living among palm trees.
palliatus: cloaked.
pallidus: pale.
palumbarius: pertaining to pigeons,
palustris: living among swamps.
papillosus: papillose.
paradisea: of paradise.
parasiticus: parasitic.
parietalis: pertaining to the sides.
parvus: small.
passerinus: sparrow-like.
paucidens: few-toothed.
pecoris: pertaining to cattle.
pelagicus: oceanic.
pellucidus: pellucid.
peltastes: Gr. large-scaled.
peltatus: shielded.
penelope: a widgeon; also the wife of Ulysses.
pennsylvanicus: Pennsylvanian.
peregrinus: wandering.
perspicillatus: transparent.
phaenna: translucent.
phasianellus: a little pheasant.
phenax: Gr. deceptive.
philadelphia: Gr. brotherly love.
philadelphica: Philadelphian.
phœniceus: crimson.
photogenis: Gr. born of light.
phoxocephalus: Gr. tapering-headed.
pictus: painted.
pidiensis: Great Pedee River.
pileatus: capped; crested.
pilosus: with thin hairs.
pinetorum: living among pines.
pinniger: large-finned.

pinus: pine tree.
pipiens: chirping; piping.
piscivorus: fish-eating.
pisculentus: fishy.
plagiatus: thievish.
plargyrus: Gr. silver-sided.
platycephalus: Gr. flat-headed.
platyrhinus: Gr. flat-nosed.
platyrhynchus: Gr. flat-nosed.
platystomus: Gr. flat-mouthed.
plumbeolus: lead-colored.
pœcilura: Gr. tail variegated.
polyglottus: many-voiced.
pomatorhinus: Gr. snout operculate.
podiceps: a grebe.
pomotis: a sunfish.
porosus: porous.
porphyriticus: purplish.
portlandicus: pertaining to Portland.
præstabilis: standing first.
pratincola: living in meadows.
princeps: princely.
principalis: princely.
procne: Gr. a swallow.
productus: produced.
promelas: Gr. black forwards.
proriger: having a prow.
prosthemius: added.
protacanthus: Gr. anterior spine large.
proteus: of many shapes.
proximus: near.
pruinosus: frosty.
pseudogeographicus: not quite geographicus.
pseudoharengus: not quite a herring.
pubescens: pubescent.
pugnax: quarrelsome.
pulchellus: pretty.
pullus: dusky.
punctatus: dotted.
punctulatus: finely dotted.
purpureus: purple.
pusillus: weak.
putorius: ill-scented.
pygmæus: pigmy.
quadracus: four-spined.
quadrilateralis: four-sided.
quadrivittatus: four-striped
querulus: querulous.
quiescens: quiescent.
quinnat: an Indian name for the salmon, meaning glittering.
radix: Root (river in Wisconsin).
rattus. rat.
regius: royal.
reticulatus: reticulate.
rhombifer: bearing rhombs.
rhotheus: Gr. pertaining to falls.
rigidus: rigid.
riparius: pertaining to shores.
robustus: robust.
rostratus: large-billed or snouted.
rubellus: reddish.
ruber: red.
rubicundus: ruddy.
rubidus: ruddy.
rubricaudus: red-tailed.
rubricroceus: saffron-red.
rubrifrons: red-faced.
rufescens: rusty-red.
ruficapillus: rusty-crowned.
rufilineatus: rusty-lined.
rufus: rusty-red.
rugosus: rough.
rupestris: living among rocks.
rusticola: living in the country.
ruticilla: somewhat fiery red.
rutilus: fiery red.
sacer: sacred.
salar: a salmon.
salmoides: like a salmon.
salmoneus: like a trout.
sanguifluus: blood-flowing.
sanguinolentus: bloody.
sapidissimus: most delicious to eat.
satrapa: a prince (knight).
sauritus: like a lizard.
savanna: Savanna.
scaber: rough.
scabriceps: rough-headed.
scandiacus: ascending (or Scandinavian?)
scomberius: mackerel-like.
scopiferus: bearing a mark.
scutatus: with scutes.
scylla: a rock near Charybdis
sebago: Lake Sebago.
selene: Gr. the moon.
selenops: Gr. moon-eye.
semifasciatus: half-banded.
semipalmatus: semipalmate.
septentrionalis: northern.
serpentinus: serpent-like.
serrator: one that saws.
serripinnis: saw-finned.
sexlineatus: six-lined.
sialis: plump.

siccuIus: dry, *i. e.*, found in pools left by drying of streams.
simoterus: Gr. snub-nosed.
simulans: resembling.
simus: Gr. snub-nosed.
sirtalis: like a garter.
sisco: vernacular, Cisco.
siscowet: Indian name.
socialis: sociable.
solitarius: solitary.
sparverius: pertaining to a sparrow.
spatula: a spatula.
speciosus: handsome.
spectabilis: notably handsome.
spectrum: a sight to see.
spectrunculus: a little image.
spelæus: living in caves.
spilopterus: Gr. spotted-finned.
spilotus: Gr. spotted.
spinifer: spine-bearing.
spirlingulus: French *eperlanule*, a little smelt or sprat.
sponsa: a bride.
spurius: spurious.
squamiceps: scaly-headed.
stellaris: starry.
stellatus: star-spotted.
stelliferus: star-bearing.
stigmaticus: Gr. spotted.
stramineus: straw-colored.
streperus: noisy.
striatulus: narrowly striped.
striatus: striated.
sturio: a sturgeon.
subcæruleus: somewhat blue.
subis: sudden.
subterraneus: underground.
subulatus: subulate.
subviolaceus: somewhat violet.
sucetta: French *sucet*, a sucker.
superciliaris: pertaining to the region over the eye.
superciliosus: ridge above the eye.
sylvaticus: living in the woods.
symmetricus: symmetrical.
talpoideus: mole-like.
talpoides: mole-like.
tarandus: a reindeer.
telescopus: Gr. far-seeing
tenellus: slender.
teres: terete.
teretulus: terete.
tergeminus: triple.
tergisus: polished.
tessellatus: checkered.
thalassinus: Gr. sea-green.
tigrinus: tiger-colored.
toma: name of an Indian.
torquatus: with a collar.
trachyrhynchus: Gr. rough-billed.
trichas: Gr. a kind of thrush.
tricolor: three-colored.
tridactylus: three-clawed.
tridecemlineatus: thirteen-striped.
triseriatus: three-rowed.
triunguis: three-clawed.
tristis: sorrowful.
troglodytes: a wren.
truncatus: cut off squarely.
tuditanus: hammer-headed.
tullibee: Indian name.
typicus: typical.
tyrannus: a king-bird.
ulula: a bird that hoots.
umbellus: ruffed.
umbrosus: shady-colored.
undulatus: wavy.
uranops: Gr. sky-gazing.
urus: a wild bull.
vallisneria: eel-grass (which food improves the flavor).
vandoisulus: French *vandoise*, a dace.
variatus: variegated.
variegatus: variegated.
varius: various.
velatus: with a large sail.
velifer: sail-bearing.
venenosus: venemous.
ventralis: on the belly.
vermis: a worm.
vernalis: spring.
versicolor: various colored.
verticalis: vertical (on high).
vespertinus: evening.
villosus: hairy.
violaceus: violet.
virescens: greenish.
virens: green.
virginianus: Virginian.
viridescens: greenish.
viridis: green.
viscosus: viscid.
vison: a scout; spy.

vitreus: glassy.
vittatus: striped.
vitulus: a bull-calf.
vociferus: loud-voiced.
volucella: flying.
vulgaris: common.
vulneratus: wounded.
vulpinus: fox-like.
xanthocephalus: Gr. yellow-headed.
xiphias: Gr. a sword.
zebra: zebra.
zonalis: banded.
zonatus: banded.
zopherus: Gr. dusky

INDEX TO NAMES

OF

GENERA AND HIGHER GROUPS,

WITH THEIR DERIVATIONS.

NOTE.—In this index, names of genera recognized in this work are printed in ordinary type, as Dendrœca; families and higher groups in small capitals, as EMYDIDÆ; synonyms and sub-genera in italics, as *Amblodon*. In giving the etymology of terms, all words not otherwise designated are understood to be Greek; L. indicates Latin. Greek words are here, for convenience, printed in Roman characters.

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FURTHER ADDENDA.

It is practically impossible to keep a faunal work like the present fully "up with the times." Since the last proofs were read, the following additions to our fauna have been noted: (December 1879.)

To page 70, after *Pyranga æstiva*, add:

3. ***P. ludoviciana,*** (Wils.) Bon. "LOUISIANA TANAGER." Male bright yellow; back, wings and tail black; head scarlet; two yellow wing-bars; ♀ as in *rubra*, known by the wing-bars. Rocky Mountains to the Pacific, accidental at Lynn, Mass. (*Brewer.*)

To page 88, after *Passerella*, add:

18. (b) CALAMOSPIZA, Bonaparte. LARK BUNTINGS.

1. ***C. bicolor,*** (Towns.) Bon. WHITE-WINGED BLACKBIRD. Black, with a large white wing-patch, and white on quills; ♀ streaky, like the female Bobolink, but known by the whitish wing-patch; bill stout; inner secondaries as long as the primaries; L. $6\frac{1}{4}$; W. $3\frac{1}{2}$; T. $2\frac{3}{4}$. Western plains, accidental in Massachusetts.

Page 154. The females of *Urinator immer* and of some other swimming birds, lack the head markings described in the text, and are dull or streaky.

Page 155. The occurrence of *Podiceps cristatus* in America at all, is lately denied by Dr. Brewer.

To page 219, after *Pleurolepis pellucidus*, add:

2. **P. asprellus**, Jordan. ROUGH SAND DARTER. Form of *P. pellucidus*, but the squamation much more complete, and the scales rougher; sides, back and breast with imbricate scales; size larger and colors darker than in *pellucidus;* fins high; D. IX—10; A. I., 8, lat. l. 98. Sandy streams in Illinois. "Has in life all the colors of the rainbow."

2. (b) IOA, Jordan and Brayton.

1. **I. vitrea,** (Cope) Jordan. GLASSY DARTER. A species apparently similar to the last, but with smaller fins, and much larger scales; D. VII—14, A. II, 9; lat. l. 56. North Carolina.

On page 225, after *Nanostoma zonalis*, add:

2. **N. vinctipes,** Jor. May be known from *N. zonalis*, by the absence of the bands encircling the belly, and by the fact that all the fins, *including the ventrals*, are strongly barred. Illinois River.

On page 227, after *P. jessiæ*, add:

4. **P. asprigenis,** Forbes. ROUGH-CHEEKED DARTER. Short and stout; cheeks and opercles *entirely scaly;* scales large; lateral line about to end of second dorsal; spines high; coloration apparently as in *variatus;* spinous dorsal dusky behind; D. XII—13; A. II, 8; lat. l. 48. Illinois River.

5. **P. virgatus,** Jor. A slender species, known by the naked head, black-striped body (as in *Etheostoma lineolatum*), and by the presence of a black humeral scale. Rock Castle R.

6. **P. punctulatus,** Ag., from Mo. and S., has likewise a black humeral scale, but the cheeks are scaly and the body not striped.

On page 229, after *B. eos*, add:

4. **B. barratti,** Holbr. Short, chubby and compressed; depth $4\frac{1}{4}$ in length; head $3\frac{3}{4}$; lat. l. on 13 to 30 scales; D. X—13, A. II, 7; lat. l. 42 to 56. Colors greenish, with dark specks, no blue or red. Georgia to Texas, lately taken by Prof. Forbes in Southern Illinois.

16. (b) VAILLANTIA, Jordan.

1. **V. camura,** (Forbes) Jordan. A slender species, resembling *Boleichthys eos* in form, and *Boleosoma nigrum* in color. D. X—11; A. I, 8. Illinois.

On page 247. Many specimens of *Elassoma zonatum* have been lately obtained by Professor Forbes in Southern Illinois. The fish, I think, unquestionably forms a separate family, the relations of which are with *Aphododeridæ*, as indicated in the text. Its pharyngeals are as in *Aphododerus;* the vertebræ are but 28 in number; the fin rays are usually, D. IV, 10; A. III, 5. No specimens have been taken more than an inch in length.

On page 296, after *Lythrurus ardens*, add:

4. **L. atripes,** Jordan. Dusky Red-Fin. A strongly compressed, deep-bodied species, known at once by the coloration of the fins, the dorsal spot being faint, and there being a dusky bar across the upper part of the fin; the anal is similarly colored to the dorsal, but fainter, and the ventrals are dusky; A. I, 11. Southern Illinois.

On page 284, after *jj.* ——— Lythrurus, add:

ii. Teeth without masticatory surface, their edges always serrate. . . . . . . Cyprinella, 8 (*b*).

On page 296, before *Minnilus*, add:

8. (b) CYPRINELLA, Girard.

1. **C. forbesi,** Jordan. Forbes' Red-Fish. Body short, very deep, much compressed, the depth 3 in length; color in life chiefly red, a violet crescent behind opercle; fins plain red; head and caudal peduncle profusely tuberculate; A. I, 8; lat. l. 35; teeth 4—4. Southern Illinois, an elegant little fish.

On page 223, et. seq. Generic names ending in the Greek neuter roots "*soma*," "*stoma*," "*isma*," etc., have been in this work considered as Latin *feminine* nouns, and the adjective has been made to agree with them accordingly, as "*Boleosoma maculata*," "*Etheostoma flabellaris*." This was done in deference to certain recent authorities in classical matters, who regard such latinized words ending in *a* as feminine. It is probably better, however, to follow the common custom, and to consider them as neuter, until some other rule is definitely adopted.

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